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The Electric Cooker Demand

AS we are dealing later in this issue with some excellent progress that is being made in what we call the "East End" of London, we recall that the late Sir William Preece many years ago described electricity as "the poor man's light."

There were then no "other uses"—if we may use a modest little term which has to-day come to mean many very important applications of electricity in the average residence. These "other uses" have been chiefly responsible in recent years for the enormous increase in output of many hundreds of large and small generating stations all over the country.

When we began to supply light only, the consumer had to pay a very substantial price for each carbon filament lamp until the patents ran out in 1895 and competition in their production began. That was over forty years ago, and during the intervening period charges for electricity have passed through many variations and the types, efficiencies and prices of lamps and lighting apparatus have altered considerably, too.

The standard of illumination for everybody has risen beyond all early expectation—indeed, those days might well be regarded as the dark ages compared with the present time, when houses and flats, large and small, have many lighting points of far greater illuminating power where formerly one sufficed. The electricity undertaking originally started for lighting supply has long found it policy to encourage the larger consumption per capita for all purposes by employing systems of charging which place a premium on the use of electricity for many kinds of service, leaving the purely lighting consumer under the impression that his business is not very attractive.

Yet the use of electricity for lighting is as essential and as popular in working-class dwellings, including flats, as it is anywhere, because nearly everybody appreciates the merits which the electric light possesses over other illuminating agents. Gas undertakings do not disguise their recognition of these merits and of the changed attitude of the public. They attach increasing importance to methods of domestic cooking, where the habit of the public is changing less rapidly than it might.

Those who are daily working for the popularisation of domestic electrical service are naturally dissatisfied with the rate of electric cooking progress. In some places, as has recently been pointed out at a Manchester electrical meeting, the annual connections of cookers to the mains is very substantial, while in others the rate of progress is quite unsatisfactory. As a matter of fact, even the best figures that have been quoted have not been gratifying to enthusiasts, who feel that electric cookers ought to be displacing gas cookers by many hundreds of thousands every year.

Somebody has remarked recently that there was something wrong somewhere. It would be useful if there could be a heart-to-heart talk between electricity supply authorities, cooker manufacturers and contractors for a real investigation of the position.

We stand with those who hold that electric cooking progress is much too slow and believe that there is ground for the criticism sometimes levelled at supply authorities that they are too much inclined to boast of what they have achieved. We have to aim at producing in the public mind the same attitude towards electric cooking that they have toward electric lighting. Why cannot they be brought to see that it is an absolute necessity?

It is sometimes felt that many of our demonstrations to the public are half-hearted, that cookers and utensils alike are too expensive, that hot plates are lazy, and therefore irritating. These and many other aspects have been discussed over and over again, and manufacturers are ever striving to deal with their part of the problem, while supply authorities bring the cooker into the region of practical politics for thousands of consumers by their hire and hire-purchase and maintenance systems.

Hire and Hire-Purchase

HIRE or hire-purchase has become a more or less general habit; indeed, out of our eight million consumers very large numbers are quite unable to think in terms of capital outlay where the cost exceeds a few pounds. The discussion in the House of Commons last Friday indicated very plainly into what disrepute hire-purchase has fallen through the methods adopted by some people. When we consider the subject in its relation to electricity supply we remember with satisfaction that these bad practices have not been present where hire and hire-purchase methods have been instituted by electricity supply undertakings. There is no doubt whatever that the electric cooker has been improved in design and construction, and the small-flat life of recent years has led to the introduction of smaller classes of apparatus, which bring both hiring and capital outlay more within the modest means of the million. At this moment, when, in spite of the trade activity and higher wages of the country, the cost of living is being felt by the rank and file of our people, there can be no doubt that the lower and more easily understood the tariffs, the lower the cost of the apparatus, and the more prompt and ready the maintenance service, the sooner shall we see the domestic load reach figures which are now visionary. Whatever the future, of distribution, it seems almost incontrovertible that it is the duty of electricity supply authorities to push intensively business of the kind indicated, giving the public what it ought to have, including service, at a minimum price, with the least possible trouble, through their own business-getting, commercial development and propaganda officials.

The Bill in Sight

THE Minister of Transport informed a deputation last week that the text of the new Electricity Bill would be issued during the Christmas recess. Presumably, therefore, the Bill will be presented for first reading before Parliament "breaks up." Mr. Burgin also said that members would be allowed a month in which to digest the proposals before the second reading. For the rest he merely reiterated what has been said before, *i.e.*, that the Bill would empower the Electricity Commissioners to prepare schemes after local inquiries, such schemes being subject to the approval of the Minister and Parliament. We have already reported that the Electrical Power Engineers' Association had discussed with the Electricity Commissioners the question of compensation for displaced employés and Mr. Burgin promised that provision for such men would be made in the Bill.

Refrigerator Co-operation

SOME figures are given in the current issue of E.D.A. *Bulletin* which illustrate the value of co-operation between the Association and refrigerator manufacturers in the 1937 campaign. It seems that some 224 supply undertakings used E.D.A. sales and publicity material—the "literature" numbered over half a million pieces. The result recorded is an increase of 27½ per cent. in the sale of refrigerators by supply authorities.

Radiological Research

THE radiological industry should become more flourishing than hitherto now that the municipal hospitals are assuming a better standard and purchasing more equipment, but there appear to be no indications that it will be in a position in the near future to carry out the large-scale organised research which has been evident on the Continent for many years. Apart from the research which is being carried on by the physicists of our important hospitals and the N.P.L., most of which is concerned with the application and measurement of X-radiation and not with its production, a negligible amount of serious investigation and development is undertaken in this country, with the possible exceptions of those associated with the continuously evacuated tube and cine-radiography. As a consequence we have much ground to cover before we can hope to attain parity with our Continental neighbours in this field, and until that is secured we must frequently purchase from abroad for certain requirements, and the home industry cannot hope to secure more than a small proportion of the world trade in X-ray plant.

Meter Testing Stations

PARTICULAR point is given to a recommendation contained in the latest annual report of the Electricity Commissioners by the I.E.E. paper of Mr. C. W. Hughes (a report of which appears in this issue). This recommendation is that the margins for additional work that are available in many meter testing stations should be utilised by other undertakings. It means that many more than the 190 undertakings that are without test houses should co-operate with their neighbours in improving their equipment rather than incur unnecessary expenditure by isolated action. Mr. Hughes shows that the most accurate methods are beyond the means of many undertakings and that more than the bare minimum of equipment required by the Commissioners should be provided to secure efficiency in meter testing. Powers to enable two or more undertakings to make arrangements on these lines are given by the Meters Act.

Justifiable Economy

WE are all familiar with the story of the husband who took his wife to see the shops on early closing day, but that of the husband who took credit for inveigling his wife into the local electricity showrooms for an evening's entertainment belongs to the same family. An evening paper records that during the hearing of a domestic dispute at a London Police Court a husband pleaded that he did take his wife out and that he recently took her "for an evening at the local electricity showrooms." That this is a very right and proper thing to do we shall all agree, but we suspect, as in the case of the first of the above-said husbands, the outburst of regard was made on the grounds of economy. Yet does it not remain that, whatever the reason, there are, at any rate, some places where amusement is more costly, but which provide much less of interest to the housewife? How little we seem to appreciate the relation of domestic electricity to domestic felicity and connubial bliss!

Post Office and Wireless Relays

WHEN the Government accepted the recommendation in the Ullswater Committee's Report on Broadcasting that the wireless relay systems should be handed over to the Post Office, it was not thought at the time that the Post Office had any intention of developing the relays on a large scale. It seems, however, that it is now contemplating broadcast relay systems on a national scale with a view to providing facilities for reception in this form throughout the country. There are two alternative methods by which this can be done, either by audio-frequency distribution or by distribution at carrier frequency, when the same line can be utilised for several transmissions. Audio-frequency methods have been in general use by relay services for some time. In 1934 a demonstration was given in Liverpool to show the possibilities of broadcast relaying over the electricity supply mains by the carrier method, and the success of the demonstration resulted in an attempt to obtain Parliamentary sanction for electricity supply authorities to utilise their mains for this purpose. Opposition to the idea was considerable and eventually it was dropped, but at the time the Postmaster-General stated in the House that he did not oppose the idea in principle. It seems likely that in developing the relay system on a national scale the Post Office will not lose sight of the possibility of utilising supply wires, and tests have recently been carried out. If the Post Office is authorised to use supply wires for this purpose the propaganda value to electricity suppliers might well be regarded as adequate compensation, even if no substantial payment were made.

Electricity in the East End

Building up the domestic load

Notable progress has been made during the past two years in Bethnal Green, Poplar, Shoreditch and Stepney

THERE is probably no other district with problems so peculiarly its own as the East End of London. This term "East End" relates particularly to the nine square miles covered by the metropolitan boroughs of Bethnal Green (borough electrical engineer and manager, Mr. E. E. Jolly), Poplar (borough electrical engineer and general manager, Mr. R. Illingworth), Shoreditch (acting borough electrical engineer, Mr. P. C. Ebner; consulting electrical engineer, Mr. W. Weekes), and Stepney (borough electrical engineer and general manager, Mr. A. E. Campbell).

Immense schemes of property demolition, a constantly shifting population, a large proportion of Jewish residents having their own special requirements as regards cooking, &c., and a diversity of industries both large and small are only a few of the factors which contribute to making the supply engineers' lot an unenviable one.

As long as ten years ago, possibly before, many people were saying that saturation point in electricity supply was being reached in the district. How wrong they were is shown by the fact that since then the annual consumption for the whole area has been more than doubled. Development has been especially rapid during the past two or three years. The annual sales of electricity have increased in Bethnal Green from 13,651,860 kWh in 1934-35 to 16,226,278 kWh in 1936-37, in Poplar from 50,767,821 kWh to 63,034,713 kWh, in Shoreditch from 31,603,239 kWh to 35,580,041 kWh, and in Stepney from 83,158,772 kWh to 98,083,094 kWh.

To what is this remarkable improvement attributable? Increased industrial prosperity to a certain extent no doubt, but so far as recent years are concerned, at any rate, it is without question the once-despised domestic load to which thanks are largely due. It is, in fact, only just lately that there has been any real appreciation of its value. In spite of the difficulty of segregating the various components of the load it is fairly safe to say that sales of electricity for household purposes have increased by about one-third during the past two years and now represent approximately one-third of the total consumption.

Once having decided to "go out for" the domestic load, the engineers have been quickly making up for lost time, and both their methods and achievements have been making many other undertakings take notice. The courage and enterprise of Poplar, for instance, in introducing a penny per "unit" charge for electricity, including the hire of a cooker and wash boiler (or water heater), wiring installation and maintenance have met with truly phenomenal success.

Assisted by the annual demonstrations referred to later, this tariff (or its alternative of ½d. a "unit" and a monthly charge of 3s. 6d. for the cooker, wiring, installation and maintenance, plus 1s. for wash boiler or water heater) has been directly responsible for increasing the number of cookers installed from six at March 31st, 1934, to 8,000. Originally this scheme did not cover wash boilers and water heaters, but since March 31st, 1935, there has been an advance of from 260 to over 2,400 in the installation of the former, water heaters connected rising from 344 to 1,400 since March 31st, 1936. Furthermore, since Poplar became electrically minded electricity sold for domestic heating and cooking alone has increased by about 4½ million kWh per annum.

There has not yet been time to see the fruits of a similar scheme introduced by Shoreditch this year. Besides covering the installation, hire and maintenance of a cooker the 1d. per "unit" charge applies to heating as well as cooking requirements, but a minimum of 1,250 kWh a year must be used. In this borough at March 31st last there were connected 394 cookers, 18 water heaters, 105 wash boilers and 1,987 fires.

Several other modifications of electricity charges have been carried out since the "domestic drive" began, but in spite of the apparently large number of tariffs available the results are much the same. Three alternatives are open to domestic consumers at Stepney. Provided they use a cooker or water heater they can obtain supplies for cooking and heating at ½d. per kWh, plus a monthly hire charge for apparatus installed. Also, subject to the use of a cooker or water heater, supplies are given at a flat rate of a penny (with a minimum consumption). Under the third scale instituted by the undertaking

Above: If a Stepney housewife does not come to the showroom the showroom comes to her. Left: Substituting an up-to-date electric wash boiler for an old-fashioned copper at Shoreditch. Below: A consignment of cookers being delivered at a block of flats at Shoreditch *[Elec. Rev. photos.*

Sampling the products of a recent fish-frying demonstration at the Roman Road Baths, Bow [*Elec. Rev. photo.*

9 kWh per quarter is supplied at 4d. per kWh for each 100 sq. ft. of floor area up to 300 sq. ft., 3 kWh per quarter for each additional 75 sq. ft. at 4d. and the remainder at ½d.

A scheme for hiring domestic appliances commenced in Stepney in February, 1934, and since then 3,858 cookers, 1,313 wash boilers, 1,624 fires, 3,862 kettles, and 3,573 irons have been connected. Water heaters were added to the scheme last April, and already nearly 350 have been connected. About 220 consumers have installed refrigerators.

Two-part "all-in" charges are in operation both in Shoreditch (quarterly fixed charge 6s. 6d. up to four rooms plus 1s. 6d. for each additional room; "unit" charge, ¾d.), and Bethnal Green (12½ per cent. of the rateable value plus ½d. per "unit"). In the latter borough, where, incidentally, all meter rents have just been abolished, a hire scheme introduced by Mr. Jolly a year ago has been responsible for getting 400 cookers on to the mains. A scheme for the hire of 1½-gal. water heaters started at the end of August has resulted in some 250 having been connected.

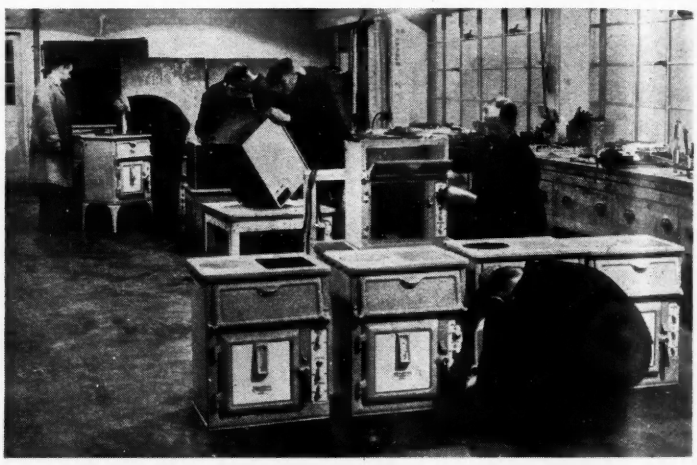
Cookers are indistinguishable from new when they have passed through the Poplar repair shop [*Elec. Rev. photo.*

A special charge for lighting and heating at Poplar incorporates a fixed charge of £3 7s. 6d. per annum per kW installed for general lighting, and £1 2s. 6d. per kW installed for occasional lighting plus a "unit" charge of ½d. Lighting flat-rate charges range from 3d. at Shoreditch to 3½d. at Bethnal Green, 4d. at Stepney and 4½d. at Poplar. Assisted and free wiring facilities are being much appreciated.

The average prices per kWh sold (1.720d. in Bethnal Green, 1.187d. in Poplar, 1.417d. in Shoreditch, 1.242d. in Stepney) compare favourably with those for similar undertakings. These figures tend to rise with the growing proportion of domestic consumption and rental-wiring supplies.

In all four boroughs the showroom accommodation is far from adequate to meet the present needs. The engineers are well alive to this fact, and they all have schemes in hand for improving the facilities. With three showrooms (at East India Dock Road, Roman Road and Bow Road), Poplar can probably claim to be best equipped at the moment, but none of these premises is worthy of a go-ahead undertaking. The first step towards remedying this was taken recently by the adoption of plans for the complete reconstruction and enlargement of the East India Dock Road premises to provide first-class showrooms and demonstration rooms and, at the same time, permit centralisation of offices.

Having only recently taken over the management of its electricity supply—till September 30th, 1936, the undertaking was operated by the Stepney Electricity Department—Bethnal Green has had to make shift for the time being with temporary accommodation in Old Ford Road. Though all the available space is really required for offices, it has been felt essential to set aside two extremely small rooms as a showroom and a demonstration room. The wisdom of this arrangement is apparent from the fact that in nine months there have been 14,000 callers. This interest promises well for the time when, on the completion of the new municipal buildings, the Electricity Department will have practically the whole of the town hall at its disposal.

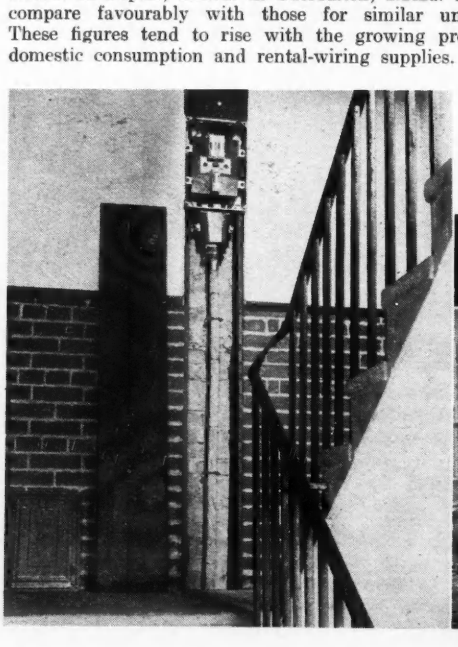


Mr. Jolly has ideas of his own regarding the qualification of a showroom assistant. The "personal touch" is everything, he believes, and he attributes much of the success of the present showroom to the employment there of a local ex-wireman who is intimately acquainted with the problems and habits of the residential population.

Two new showrooms designed on the most up-to-date lines are shortly to be built at Stepney, one (the larger) in Commercial Road and the other in Whitechapel Road. Their layout will be similar, and Mr. Campbell is making a particular point of securing straight-in entry to the counters. Meanwhile the good work is being carried on at the existing showroom at the headquarters of the undertaking at 27, Osborn Street, Whitechapel.

One showroom, centrally situated in Hoxton Street, is considered sufficient to cater for the one-square-mile area of Shoreditch. Accommodation there is, however, very restricted, and it is hoped before long to carry out a considerable scheme of extension and modernisation.

Whatever the limitations of showrooms, demonstra-



Left: Rising mains (with cover removed) at the Wellington Estate flats, Bethnal Green. Below: Erecting a feeder pillar in Commercial Street, Stepney [*Elec. Rev. photos.*

tions of cooking, &c., are a regular feature of the undertakings' service, which is becoming increasingly appreciated. Approximately 7,000 consumers take the opportunity each year to see the annual dramatised demonstrations which Poplar started in February, 1935, when first introducing its penny a "unit" all-in tariff. These amusing performances are contrived in an ingenious way to introduce a cooking demonstration into a sketch. Free refreshments are provided, as well as free gifts of electrical appliances and the food cooked. The effectiveness of this type of publicity is unquestionable, and, impressed by the results, Erith and St. Pancras have adopted similar methods of bringing new schemes to the notice of the public.

Frying fish electrically was a novelty at a series of demonstrations given last month at Poplar for the benefit of consumers in Bow. It is thought that there is a considerable market for apparatus for this purpose on hire-purchase terms.

Bethnal Green seems particularly receptive to new ideas, and at a small exhibition held recently for a week by the local Chamber of Commerce the Electricity Department managed, through its stand and daily demonstrations, actually to book orders for 50 cookers, 40 water heaters, three vacuum cleaners and one washer. Shoreditch and Stepney install cookers free of charge in domestic training centres.

As part of its "follow-up" service, Poplar has taken on four demonstrators whose job it is to give every assistance to new users of cookers, &c., even to the extent of cooking a dinner in the consumer's home. Stepney does the same. Poplar also employs four canvassers. Meter collectors are encouraged to make contacts at Shoreditch, where, in addition, there is one full-time canvasser. To a certain extent, the consumers' engineers assist the one full-time canvasser in Stepney.

Radiant-type hot-plates are much in favour. Apart from questions of efficiency they have a definite appeal, as users appreciate being able to see that they are "on." Furthermore, they do not require any special utensils.

Generally speaking, relations with the neighbouring gas undertakings are amicable—especially at Stepney, where the recent increase in gas prices is much appreciated! At Bethnal Green, however, there has been a certain amount of "poaching" in the endeavour to induce electric cooker users to install gas rings for boiling. Mr. Jolly is finding that the radiant hot-plate is proving a very potent antidote for this type of propaganda, and for this reason alone has decided to standardise this kind of plate on all cookers.

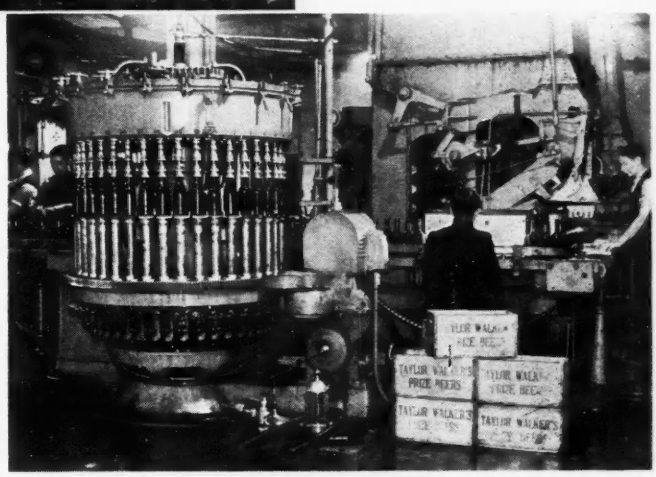
So much frying is done in the district, especially by the Jewish population, that the standard hob equipment on the smaller type of cookers is not sufficient, many consumers requiring two boiling plates as well as the grill-boiler. This is particularly the case in Poplar, where it is the practice to supply an extra radiant plate.

All the undertakings have facilities for renovating appliances, and when they have been reconditioned one would have to be very observant to distinguish them from new. A new meter test-room is nearing completion at Digby Street, Bethnal Green.

The domestic load is definitely tending to improve the load factor, but, unlike better-to-do neighbourhoods, the undertakings secure little benefit from electric cooking by way of providing a week-day evening off-peak demand. Hot meals are almost invariably prepared at midday, usually only once or twice a week, generally at week-ends.

The peak loads (the m.d. usually occurs between 4 and 5.30 p.m.) are as follows: Bethnal Green, 7,000 kW; Poplar, 25,000 kW; Shoreditch, 17,000 kW; and Stepney, 42,000 kW.

The effect of the development of domestic electric heating



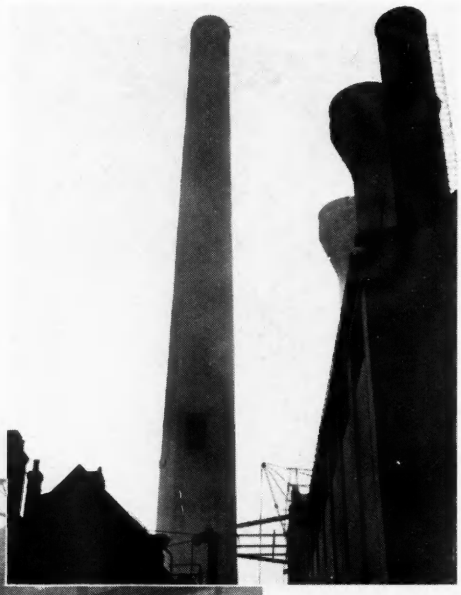
Electricity is used to a large extent for power purposes in the Thames area. On the left is an electric crane used in connection with the coal-handling plant at the Limehouse power station. The electrically driven beer bottling machine (below) is at Taylor Walker & Co.'s brewery which takes nearly two million kWh a year from the Stepney undertaking [*Elec. Rev. photos.*

How old-fashioned unhealthy kitchens are being replaced by modern all-electric kitchens on the Claredale Estate, Bethnal Green [*Elec. Rev. photos.*

and cooking is particularly noticeable at Poplar on winter Sundays, where the maximum demand at 1-1.30 p.m. is 3,000 kW more than the maximum demand after dark and is much the same as that on Saturday evenings.

Increases in the numbers of consumers can almost all be attributed to the advance in the domestic field. Since March 31st, 1935, the totals have risen as follows: Bethnal Green, from 11,028 to 16,380; Poplar, from 27,178 to 31,300; Shoreditch, from 22,184 to 23,200; and Stepney, from 36,300 to 41,000. The total connected loads are: Bethnal Green, 26,626 kW; Poplar, 115,977 kW; Shoreditch, 52,730 kW; Stepney, 121,604 kW.

The enormous schemes of rehousing being carried out both by the London County Council and the local borough councils will undoubtedly benefit the supply undertakings in the long run, but at the moment they are necessitating a considerable amount of reorganisation of distribution arrangements. Bethnal Green is the borough most affected. At least one-third is scheduled for reconstruction, and one scheme alone, a part of the L.C.C.'s first comprehensive town-planning scheme, covers 46 acres.



This new chimney at the Limehouse station is believed to be the tallest in the south of England. Below: Enlarging the Evelyn Street sub-station, Shoreditch [*Elec. Rev. photos.*

Arranging for the load-carrying cables to run vertically instead of horizontally is a problem which requires an entirely new technique. During his eighteen months at Bethnal Green Mr. Jolly has spent a good deal of time going into this question of rising mains, and he is particularly pleased with the results obtained by using fibre cables. Mr. Illingworth is carrying out similar investigations into the peculiarities of rising mains and is also devising schemes for wiring old flats.

Apart from the engineering side, the demolition schemes provide the supply authorities with a new worry. Often whole streets are cleared away, leaving hundreds of pounds of cabling buried valueless under the ground.

A problem which is being accentuated by the erection of more and more flats is that of a constantly moving population. Somewhere between 120 and 150 transfers are carried out every week in Poplar alone—nearly all on Saturday mornings—while the other three boroughs can all count on having 10 or 12 a day to do.

Poplar supplies much industrial plant on hire purchase. Here arc-welding apparatus is seen in use at C. Butterfield & Co.'s metal works [*Elec. Rev. photo.*

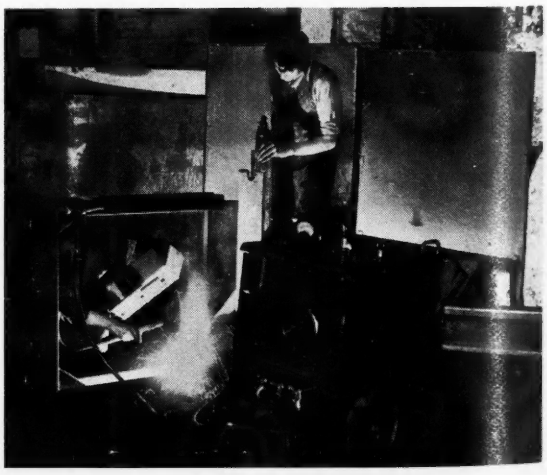
A large proportion of the supplies is given through prepayment meters, and consumers in Bethnal Green and Shoreditch at any rate seem to like to have them calibrated to overcharge them considerably. Collectors are sure of a welcome at Bethnal Green, where many of the meters are set so that a half of the contents is returned. In fact, it is no unusual thing for consumers to insert many more coins than are necessary in order to save up for some special event. At Shoreditch, the meters are calibrated for 1d. in excess of the actual "unit" charge in the case of lighting and ½d. for heating and cooking supplies. This difference is returned to the consumer at the time of collection and it is often used for the purchase of lamps or small appliances. Stepney, however, does not believe in over-calibration, having discontinued this method in view of the prohibitive administration costs.

Wherever possible in large housing schemes it is arranged for the fixed charge of the two-part tariff to be collected with the rent, the only disadvantage being that should a tenant get into arrears the landlord naturally looks after his own interests first.

From our foregoing remarks it must not be thought that it is only in the domestic field that progress has been made. The whole area is one of the most industrialised in the country. Poplar, indeed, claims to have every type of industry but a coal mine. Such diverse products as boilers, soap, billiard balls, baby carriages, asphalt, sugar, india-rubber, tobacco, talking pictures, clothing, oakum, safes, biscuits and dart-boards are all made in the East End. Constructional steel and paint works are particularly numerous, and Stepney supplies over eight million kWh a year, almost one-twelfth of its total output, to four breweries.

Hire-purchase schemes (12½ per cent. down and the remainder spread over a period up to five years, plus 2½ per cent. interest) are helping considerably in extending the use in Poplar of small industrial appliances such as spot welders, while Stepney and Bethnal Green will supply any apparatus on hire-purchase spread over one, two or three years. Stepney now has over 800 motors on its maintenance service.

The proximity of the Thames is of considerable value to Stepney and Poplar. River concerns generally have the reputation for being electrically minded, and there is little power employed other than electrical. The Port of London Authority is a big consumer, and the various privately owned wharves and warehouses are using an increasing amount of energy for cranes and hoists. Bordering the Regent's Canal, too, a new factory estate (to be established consequent on the clearance schemes) will give Bethnal Green an opportunity to develop its industrial load further. Considerable temporary supplies are now being given at various points in the East End in connection with the extension of the Central London Railway.



Particular attention is being focused at present on the improvement of street lighting. This is already practically

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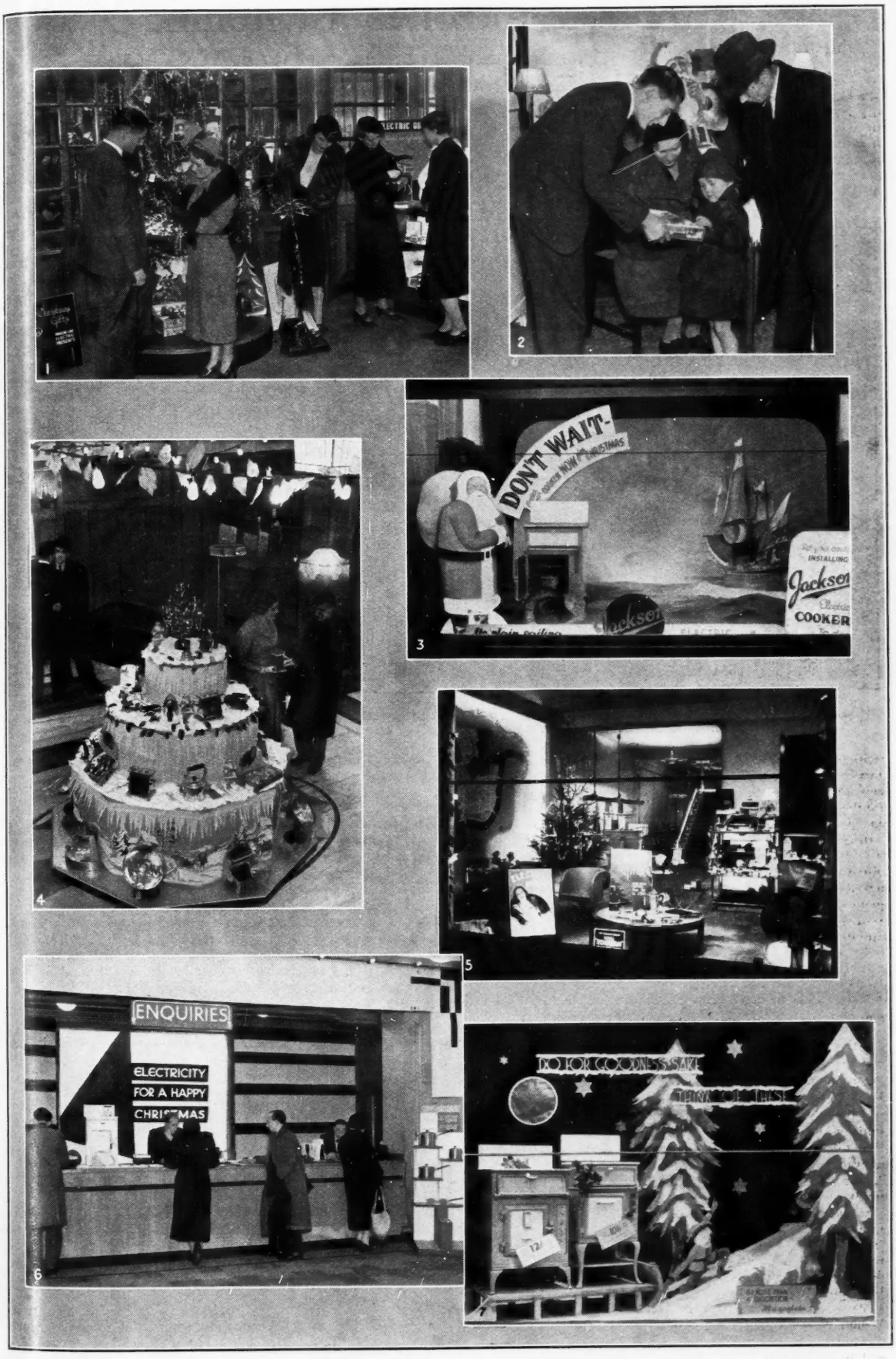


[*Elec. Rev. photos.*

Selling Electrical Gifts for Christmas. (See page 866)

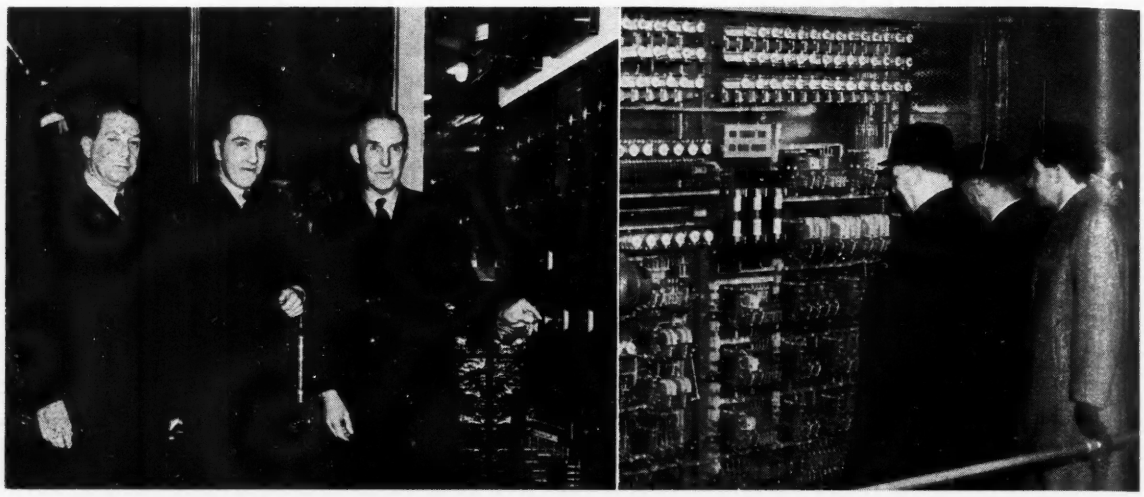
1. A Christmas tree at the L.A.E.U. showrooms at Earls Court provides a seasonal setting for electrical gifts. 2. A "young consumer" chooses Mickey Mouse lamps at the Northmet showrooms, Palmer's Green. 3. A window display at Battersea. 4. A "Christmas cake" display stand at Hammersmith. 5. What passers-by see at the L.A.E.U. Victoria Street, S.W.1, showrooms. 6. Answering Christmas inquiries at Hackney. 7. One of the County of London Co.'s Putney windows

Ripple Controlled Switching

Using the distribution network to operate h.f. relays

A SYSTEM of selective switching by high-frequency carrier currents was officially inaugurated at Maidstone last Friday by Mr. J. M. Kennedy (Electricity Commissioner). This is the first large "Actadis" installation in Great Britain, but the method has been in use for several years on the Continent for the control of public lighting from a central point, and an article on the subject appeared in the ELECTRICAL REVIEW of May 29th, 1936.

In this system the distribution network itself is used for conveying the ripple from transmitters installed at a central point of control to operate local relays. The maximum number of frequencies practicable is twelve, and at Maidstone four are employed for controlling public lighting and off-peak loads (*i.e.*, one for switching on and one for switching off in each case). At present for street lighting some 500 relays with fuses are installed in lamp columns, in addition to those on consumers' premises in connection with water heating. The number is capable of indefinite extension without modification of the emitting apparatus.



Left: Mr. J. M. Kennedy, with Mr. E. E. Hoadley and Mr. H. P. Barker (Actadis, Ltd.), switches on Maidstone's street lighting. Right: Some of the visitors inspecting the voltage regulator and control panel

In series with each of the nine 6.6-kV feeders is the secondary of an emission transformer, the primary windings of which are short circuited (in order to minimise reactance) except for the few seconds during which signals are being given. The delta-connected primary is supplied with audio-frequency currents from a 30-kVA 1,000-1,300-V three-phase Holmes alternator driven through a four-speed gear box by a 50-h.p. 400-V 1,500-r.p.m. synchronous-induction motor. The output of the set passes through banks of compensating and blocking condensers of the ordinary oil-immersed type. Voltage and frequency of the signal are regulated by servo-motor operated rheostats acting directly on the excitation of the motor and generator. The various auxiliary circuits and the capacity of the condensers are controlled from a contactor panel, the system being push-button operated from the control room.

The "Actadis" system can be installed for any voltage up to 33 kV with frequencies varying from 300 to 900 cycles (but avoiding harmonics of 50 cycles), eliminating the risk of attenuation accompanying the use of more than 2,000 cycles. The design of the emitter depends upon the characteristics of the network and not on the number of relays controlled. Although the audio-frequency current combines with the power-frequency by rippling the wave form, it is electrically separate and is transformed in the sub-stations without change of form. Arrangements are made at Maidstone, by slight variations in the periodicity, for the signals over the different feeders to be given selectively and also for the current to be injected at one point into the d.c. system.

The duty of the relays in effect is to separate the ripple from the power current and open or close a mercury switch. By the aid of a condenser a resonant filter admits the ripple to an audio-frequency synchronous motor taking the form of two tuned reeds, one vibrating at the "on" and the other at the "off" frequency. Relays can be provided to break up to 30 A a.c., but the normal rating is 18 A.

The equipment at Maidstone has been in operation now for about three months, and no relay failures have been reported. It was installed under the direction of Mr. E. E. Hoadley (borough electrical engineer), who gave especial credit to his deputy, Mr. Pope, and other members of his staff. The bulk of the apparatus was constructed for Actadis, Ltd., by A. Reyrolle & Co., Ltd., and the condensers by Johnson & Phillips, Ltd.

Electricity in the East End (*Concluded from page 848*)

all-electric, so that developments are mainly directed towards the use of electric-discharge lamps and new types of fittings for filament lamps. An extensive scheme of d.c. discharge lighting has already been carried out in Stepney, and both Shoreditch and Bethnal Green are contemplating the general adoption of discharge lighting for all the main thoroughfares. Poplar Council allocates £600 per annum towards improvements, and each year a section of the lighting is replanned.

At present developments in all directions are somewhat handicapped by the fact that, except in the case of Bethnal Green, where the whole of the area is on a.c., almost the whole of the district is still on d.c., Poplar being the best off with about 10 per cent. converted. Schemes for changing over to the standard a.c. system are well in hand in all boroughs and Poplar proposes to spend £10,000 per annum towards the conversion of consumers' apparatus. One of the most striking advantages of changing over to a.c., Mr. Campbell tells us, is that maintenance difficulties (especially with regard to cookers) have been practically eliminated.

The increasing demand for electricity has necessitated considerable extensions or reorganisation of the supply systems. Stepney has just placed an order for a new 30,000-kW generator with boilers for its selected station at Limehouse.

At Bethnal Green the number of sub-stations is being increased from five to nine (one is being moved to a new site), each having an ultimate capacity of 2,000-3,000 kW. During the last three years the number of sub-stations at Poplar has been doubled, bringing the total to 30; all these will have an ultimate capacity of 3,000 kW. As soon as a site is available a new sub-station is to be added to the four existing Shoreditch sub-stations, one of which (Evelyn Street) is now being enlarged.

The whole of the streets at Shoreditch are cabled on both sides, giving a total of 126 miles of e.h.v. and l.v. mains. Every year five miles of h.v. and two of e.h.v. cables are laid in Poplar, the present mileage being 251. Stepney and Bethnal Green own respectively 237 and 77 miles of mains in 90 and 37 miles of streets.

In spite of the inevitable increase in expenditure incurred by these various developments the financial results continue to look healthy, net profits being recorded last year as follows:—Bethnal Green, £23,003; Poplar, £34,300; Shoreditch, £19,345; Stepney, £43,921. Mr. Jolly believes in "ganging warily" to avoid the danger of his undertaking's becoming over-capitalised, and is making all the hire schemes pay for themselves, consumers not being encouraged to take more apparatus than they can afford. Stepney has just placed an order for 3,000 cookers required during the next two years.

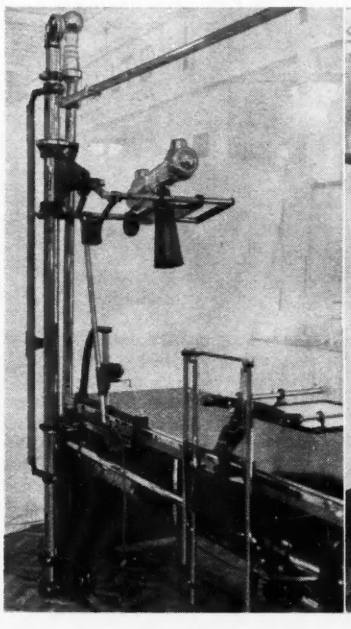
The Radiological Exhibition

By C. Morgan Davies, A.M.I.E.E.

A review of progress in X-ray and electromedical equipment since last year's display

THE exhibition of apparatus, held in conjunction with the annual congress of the British Institute of Radiology, took place at the Central Hall, Westminster, on December 8th, 9th and 10th. This year's show included a section devoted to historical and scientific exhibits, which was both interesting and instructive. The regular visitor who watches progress from year to year, looking for new developments and pointers indicating the trend of design, could not have gone away disappointed on this occasion. The main improvements observed were in connection with special and auxiliary apparatus for increasing the value of X-rays as an aid to diagnosis, the perfecting of devices for producing, applying, and measuring radiation for therapeutic purposes, and improved accessories.

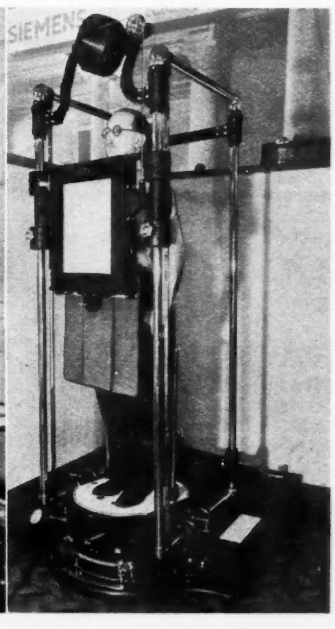
A number of units for diagnosis were exhibited, although they were not a conspicuous feature of the show. Manufacturers are making efforts to reduce the floor space occupied by the power unit. Oil immersion of rectifying valves, previously mentioned in these reviews, is being applied in some cases, Schall & Son and the Solus Electrical Co. having adopted this feature. Messrs. Schall exhibited two models, the larger one measuring 33 in. by 20 in. by 26 in. deep and incorporating an oil-immersed four-valve rectifier, while the smaller unit, measuring 26 in. by 20 in. by 26 in. deep, incorporates two valves arranged to operate as a half-wave rectifier. The respective outputs are 320 mA at 80 kVp and 200 mA at 80 kVp, the maximum available pressure being 100 kVp.



Tomograph attachment with electrical control (Newton & Wright)

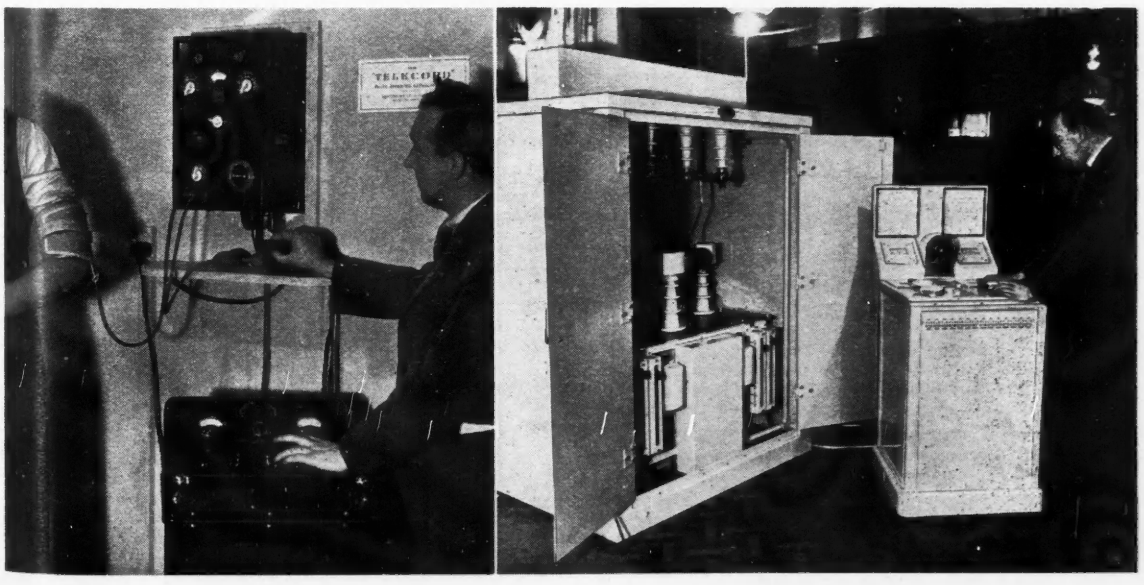
The Solus apparatus appeared to be similar in principle and included a selector, mounted on the mobile switch desk, for operating in conjunction with a remote controlled h.v. switch, this being necessary if the h.v. unit is required to connect to X-ray tubes serving different pieces of examination apparatus. All modern h.v. units are, of course, completely shockproof, and it is now standard practice to place all instruments on the switch desk, utilising instrument transformers and rectifiers where necessary.

A. E. Dean & Co. exhibited a new model four-valve apparatus having a maximum output of 600 mA at 80 kVp with a maximum available pressure of 110 kVp. The h.v. unit includes four Philips gas-filled rectifying valves and a remote controlled tube selector switch, the whole being housed in an all-metal cabinet, the overall dimensions being considerably less than those of former Dean units having comparable outputs. An all-metal cased four-valve unit with an output of 400 mA at 80 kVp, complete with accommodation for an oil-immersed remote controlled tube selector switch, and occupying a floor space 3 ft. 6 in. square, was seen on the stand of General Radiological, Ltd. This unit, in common with most, is controlled from a mobile switch desk, and provides for automatic selection of definite pre-determined tube currents, tube, and focus by the insertion of a single plug. It was exhibited in conjunction with an electrically controlled accessory device for stomach examinations, arranged so that all necessary control operations may be carried out from the examination stand or the control desk according to the circumstances.



"Sectoscope" apparatus for layer radiography (Medical Supply Assocn.) [*Elec. Rev. photos.*

Mr. Cuthbert Andrews has further reduced the weight and dimensions of his "Rapidex" h.v. unit, shown in connection with an improved field service examination apparatus. This unit is, of course, low power, as the primary considerations here are ease of mobility, assembly, and simplicity. Diagnostic units reached a reasonable degree of perfection some time

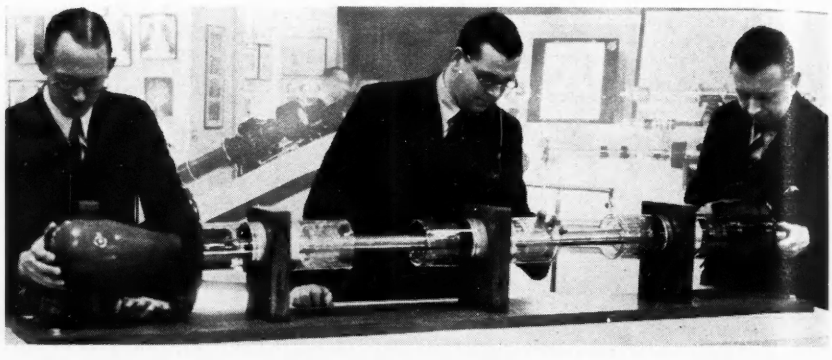


Left: "Telecord" apparatus (Watson & Sons). Right: Dean four-valve equipment [*Elec. Rev. photos.*

ago, and nowadays operate satisfactorily for long periods with little attention.

Therapy and Examination Units

The exhibition provided no real evidence of the great activity which exists to-day in the field of X-ray therapy. Large hospitals and important public bodies are giving this subject much attention in all its branches, particularly in connection with the treatment of cancer, large sums of money being expended continually. The Victor X-ray Corporation exhibited an improved model of the "Maximar" deep therapy unit. This compact assembly may be designed to operate at either 200, 220, or 400 kV, and despite its small proportions is credited with high efficiency as a radiation generator. The "Sunic Standard" superficial therapy outfit seen on the stand of Watson & Sons (Electro-Medical), Ltd., is a good example of well-designed equipment for providing treatment at pressures up to 90 kVp. This apparatus is of the non-rectified type, and the current and voltage factors are electrically interlocked so as to provide against overloading.



Philips "Metalix" 1,000-kV sealed-off rayproof tube. *[Elec. Rev. photo.*

Equipment for examination purposes was much in evidence this year, one of the leading attractions of the show being special apparatus providing for the new and rapidly increasing technique known as "tomography," "planigraphy," "sectography," &c. It may be explained that the new technique, very much in its infancy, aims at the production of screen images and radiographs of selected planes or layers of the human subject, free from superimposed shadows. At present the application is mainly confined to the examination of lung structure, chiefly in connection with the fight against tuberculosis, although it is also gradually being applied to the examination of the skull.

It is not unlikely that the new method will mark one of the most important advances in radiology since the introduction of radio-opaque media as an aid to the diagnosis of human ailments. It may be appreciated that every ordinary X-ray picture is a shadowgraph of varying intensities produced by the superimposition and summation of all formations which lie in the path of the incident beam of X-radiation, many of these formations being situated in different planes in the object undergoing examination. Various workers have laboured since 1921 to overcome the disadvantages consequent upon this complication, but only of recent years have their labours in this direction been rewarded with any practical measure of success.

Although the fundamental conceptions concerning the production of X-ray layer radiographs may be comparatively simple, the practical difficulties cannot be classed as such, and various possibilities arise. In the system generally adopted the X-ray tube and film holder are anchored to opposite ends of a pendulum, the oscillating pivot of which is adjusted so as to be in the plane of the layer it is desired to radiograph. If the system is now caused to make a single excursion in synchronism with the period of time during which the X-ray tube is excited, a co-ordinated movement of the tube focus and the film in opposite directions to one another will occur, and the projections of shadows produced from objects lying in the plane of the pivot of the pendulum will register correctly on the film, while the projections of objects in other planes will be blurred out by passive movement.

Newton & Wright, Ltd., exhibited an attachment working on this principle in conjunction with a standard radiographic couch, the device incorporating electrical control to ensure that the X-ray exposure is correctly timed relative to the excursion of the moving system. In the case of this apparatus the movement is made by hand, and as the device is comparatively inexpensive and lends itself to adaptation to existing equipment, no doubt much useful experience will be gained by its application. A. E. Dean & Co. exhibited a similar arrangement having a dashpot-controlled spring to cause the necessary movement during exposure.

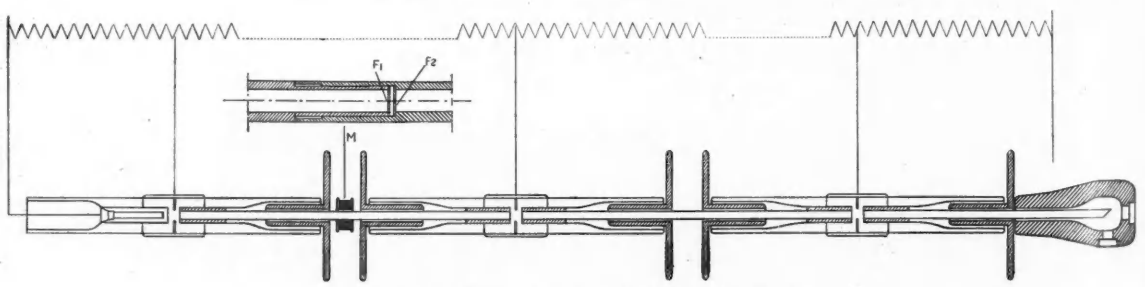
The "Sectoscope" seen on the stand of the Medical Supply Association operates on a different system. This is a complete apparatus for the technique, providing also for visual inspection on a fluorescent screen. The X-ray tube remains stationary, one advantage being that an existing tube may be used in conjunction with it. During exposure the patient and the film rotate on vertical axes, one axis lying in the layer it is desired to radiograph, the other lying in the plane of the film, both planes remaining parallel.

Another interesting device, designed to improve radiographs of the heart, is an apparatus known as the "Telecord," seen on the stand of Watson & Sons (Electro-medical), Ltd. The production of radiographs having clearly designed outlines of the heart shadow with a minimum amount of magnification presents many difficulties, due mainly to the involuntary movement of this organ. The best results are secured by the application of high-power X-ray units or condenser discharge apparatus and the employment of rotating anode tubes.

The "Telecord" apparatus may be adapted to existing X-ray units, its function being to synchronise the period of exposure so that this occurs during the most favourable period of the heart cycle. Given a certain penetration factor and other conditions which are easy to satisfy, the required density on the X-ray film is governed by the number of milliampere-seconds passed through the tube. Should the power unit be incapable of delivering the necessary quantity during an ultra-short exposure, the "Telecord" will cause it to produce the desired result by the summation of the requisite number of fractional exposures, these being superimposed on the film, each one being in phase with the same period in the train of cyclic movements of the heart. The device may also be employed with advantage to high-power units, providing facilities for the selection of the instant when the exposure shall commence relative to the cardiac cycle.

It employs a piezo-electric crystal and suitable amplifying circuit arranged to control a relay which governs the operating contactor of the X-ray power unit. The piezo-crystal is actuated by pulsations transmitted from an inflated armlet strapped to the upper part of the arm (brachial artery pulse), the resultant currents being amplified to the requisite value for contactor control. Suitable controls are provided for inflation of the pressure system, compensation for pulse lag, exposure selection, and release.

X-ray kymographs were displayed on the stands of General



Drawing showing construction of Philips 1,000-kV tube

Radiological, Ltd., and the Solus Electrical Co., Ltd. These devices are designed to record the movements of organs of the body graphically, particularly those of the heart and diaphragm, providing valuable information on the changing contours of the heart shadow, and revealing conditions otherwise hidden. The apparatus consists essentially of a moving slit camera adapted to X-ray work and operating under electrical control. The components comprise a plate of radio-opaque material provided with a series of parallel narrow slits spaced equidistant over its surface; a film holder; mechanism to cause relative movement between the film and grid during the exposure, this movement being limited to the distance between the grid spacing; and the necessary electrical control to ensure that the X-ray exposure shall synchronise with the movement. The resultant picture shows a series of changing contours of the organ under examination, the original movements being reproduced by viewing with a kymoscope, an instrument which in effect reverses the process by which the film was taken. The kymograph is now becoming firmly established with radiologists, providing further information to that furnished by cine-radiography and the electro-cardiograph.

X-Ray Tubes

One of the outstanding exhibits at this year's show was the million volt sealed-off X-ray therapy tube, seen on the stand of Philips Metalix. This tube is of the rayproof type and is rated to operate at 1,000 kV, 1 mA. A tungsten target is fitted at one extremity, five ports of exit being provided for the X-radiation. The opposite extremity houses a heated cathode, suitable "getters" being situated in its vicinity. The intervening distance is occupied by a hollow anode, constructed in sections and joined together as indicated. During manufacture a thin vane of beryllium is inserted between each section, thus permitting of separately pumping and degassing the sections, the beryllium partitions subsequently being perforated by the electron stream during conditioning of the tube.

The exciting voltage is applied in conjunction with an oil-cooled resistance suitably tapped to distribute the p.d. A permanent magnet focusing device is incorporated in the first stage of the hollow anode. The tube is guaranteed for a working life of 800 hours and is already in operation for the treatment of five patients simultaneously. On this basis it would appear that the tube cost will be in the region of six shillings per patient per hour, no mean achievement when one considers the operating voltage.

It appears that the sealed-off X-ray tube has now reached a state of perfection where long life may reasonably be expected, 30,000 mA.-hours at 180 to 200 kV being by no means uncommon, while the Victor X-ray Corporation reports one deep-therapy tube operating at 20 mA 180-200 kVp, together with its two attendant rectifying valves, still running satisfactorily after 7,000 hours. Philips Metalix exhibited an improved model "Rotalix" rotating anode diagnostic tube, while Newton & Wright were noted to have returned to the field of X-ray tube manufacture, exhibiting a rayproof diagnostic tube. Other exhibitors of tubes were Cuthbert Andrews, General Radiological, Ltd., Medical Supply Association (Westinghouse tubes) and Radiologie, Ltd.

Accessory Equipment

Many improvements were noted in connection with devices for the measurement of X-radiation in therapy and the control of fractional time exposures in radiography. Regarding the former, the most noteworthy were the new "Mecapion" seen on the stand of Watson & Sons, and the Solus "Metrion" integrating dosimeter. A. E. Dean & Co. and the Solus Co. exhibited improved time switches. Much attention is being given to illuminators for viewing X-ray negatives, particularly by Schall & Sons, Philips Metalix, and Watson & Sons. The last-named firm exhibited a viewing box designed for installation in the operating theatre. This is fitted with two 150-W "Osira" discharge lamps. The evenly illuminated high-intensity surface inspected should prove of value in the operating theatre, where the normal illumination of the room is usually bright.

The viewer of Philips Metalix is shallow and is equipped with a bank of 12-V automobile lamps, evenly distributed over the area of the glass and supplied from a small built-in step-down transformer. It is provided with a double set of adjustable blinds which enables the illuminated area to be blacked out where required. The Schall box is only 6 in. deep and is fitted with ordinary pearl lamps, the illumination of the glass surface being even. Wheatstone pattern stereoscopic viewers of improved design were shown by a number of firms, including F. R. Butt & Co. A projector suitable for standard radiographs was shown by Newton & Co., and Watson & Sons projected a specimen film to demonstrate cine-radiography.

A small amount of apparatus for cardiology, light-therapy, diathermy, and electrical treatment was on view, Stanley Cox demonstrating an improved model muscle stimulator by means of a cathode-ray oscillograph.

The impressions gained from inspection and discussion at this year's exhibition indicate that stability continues so far as power units, shockproof cable systems, and tubes and shields are concerned. This is a satisfactory condition from the point of view of the buyer, especially as it is not accompanied by stagnation in progress. The improvements noted are concerned with such things as reduction in dimensions, improved ratings for given dimensions, better control gear and devices designed to safeguard costly tubes from the human element, higher radiation efficiency and increased tube life, better safety factors and the development of attachments for improving the utility of examination and accessory apparatus as aids to clinical medicine. All these are very welcome and do not unduly complicate the situation with which the buyer is faced when considering new equipment.

"Tuto-Heliophos" four-valve set (General Radiological) [*Elec. Rev.* photo.

The diagnostic model of the condenser discharge apparatus was not in evidence this year, but it is believed that pending developments in this connection will remove the objections previously made concerning lack of flexibility and difficulty of all-round application. The solution of these problems is awaited with interest, particularly for cases where a good power supply is expensive to obtain and where the general demand includes a volume of work requiring ultra-rapid high-power exposures, involving the provision of heavy and costly feeder cables together with adequate reserves of power, which are only employed for short periods of time.

The approach to new techniques such as tomography and kymography is being made gradually by means of comparatively inexpensive attachments based upon special units which have been developed for these purposes on the Continent. This method of starting would seem logical as it gives the radiologist an opportunity to gain experience of a new method and the producer time to study possibilities concerning the permanent requirements. In this connection it may be remembered that the hospitals, particularly the voluntary institutions, usually provide the testing grounds for new developments but are often hampered in their efforts through lack of funds.

It is noteworthy that the majority of improved diagnostic and therapeutic aids are made possible by the contributions of electrical science and the ultimate benefit conferred upon the patient will be fully realised. It therefore behoves one and all to give the utmost support to the hospital, medical worker, physicist, and manufacturer. The last-named is by no means the least important, and is always ready and willing to meet special needs, make modifications and work out new ideas, within the limits of his resources, often knowing that there will be little profit, if any.

Measuring Thickness of Tin

TWO new instruments have been devised for measuring the thickness of the tin coating on tinplate. Previous methods of estimation were chemical and were destructive. One of the new instruments is magnetic and the other electro-magnetic. They are both capable of giving results rapidly without detriment to the tin coating. The method of Chalmers and Hoare employs a cobalt chrome-steel permanent magnet and measures the force necessary to pull it off the sheet, using a syphon-operated water balance for this purpose. The second instrument, devised by Tait, uses a small transformer which is placed upon the sheet so that the magnetic circuit is the core of the exploring head, the gaps being formed by the non-magnetic coating and the basis material. The former is very useful for plotting the contour of the surface and the latter is primarily a workshop instrument for measuring the average thickness and large scale variations. Differences of thickness in the coating of 0.000005 in. can be measured by the magnetic method. A descriptive publication (Series A No. 66) may be obtained free of charge from the International Tin Research and Development Council, Manfield House, 378, Strand, London, W.C.2.

Supply Costing. By C. Baron, F.C.W.A.

With particular reference to distribution

THE need for adequate and uniform costing systems in the electricity supply industry has never been more apparent than at the present time. Pending legislation holds out the certainty of changes becoming operative at some future date, so far as distribution is concerned at any rate. If "efficiency" is to be the basis on which individual undertakings are assessed for the parts they are to play in the scheme of reorganisation, then costs will undoubtedly be an important factor in arriving at these assessments.

Masses of statistics are produced frequently in support of arguments as to relative efficiency values of different undertakings, but most of them prove nothing but the patience and diligence of their authors. It is always dangerous, or at least unwise, to generalise, and how can other than general conclusions of little value and capable of no proof be drawn from statistics of the type which cannot take into account the varying methods and the particular conditions operating in each and every undertaking. The same thing very often applies to figures taken from the records of different undertakings and used for deducing "facts" about the industry as a whole.

Costs, whilst not in themselves sufficient, could form the foundations for building comparative statistical data of real value—provided, of course, that identical methods of arriving at costs were first introduced by all constituent supply authorities. There are some factors inherent in prime cost which give a basis for a satisfactory beginning to the problem. Most classes of material can be purchased at the same prices by all except the smaller authorities and wage rates are standardised throughout the industry. In the case of the smaller undertakings, who have to pay more for materials because they purchase in smaller quantities, this fact would be disclosed by the comparative costs and could be interpreted correctly as follows: that the smaller undertakings are inefficient in this respect for the simple reason that they *are* small and not necessarily because of inefficiency in the management personnel.

The same thing is true as regards the purchase of energy from the Central Board, although it must be admitted that uniformity of tariff in all the grid areas would assist a somewhat truer perspective to be taken in this respect. These factors, inherent in prime costs, are not so evident where most indirect expenditure (or "overheads" as it is usually termed), is concerned, but uniform comparative cost data, properly analysed and presented, could enable cognisance to be taken of the true facts.

An improved and uniform system would enable managers to exercise better control and permit fair comparisons to be made

The devising of some method of uniform costing for distribution and selling would present difficulties, but these would be by no means insuperable. After all, the important point is merely to ensure that all undertakings use identical methods of arriving at costs, to enable fair comparisons to be made. It would be quite unnecessary for the undertakings to severally and collectively scrutinise and agree to those methods. A small committee drawn from the industry with knowledge of the requirements, which could work with the certainty that its recommendations would be enforced, could devise a satisfactory scheme to include:—

(a) A schedule of headings for analysis of expenditure.
(b) A description of what is to be included under each heading and at what point each should begin and end.
(c) A standard method of apportioning indirect expenditure otherwise known as "overheads" or "oncost."
(d) A clear definition of each "element" of cost, and
(e) An equally clear definition of the cost units to be used in presenting data for interpretation purposes.

Whatever the effects of the new Bill to be introduced into Parliament in the near future, there are adequate reasons, even under existing conditions, for the introduction of uniform costing methods in the industry for distribution. If evidence were required of the efficacy of such methods, innumerable examples could be drawn from the commercial manufacturing world. Amalgamations or the necessity for close working arrangements between groups of manufacturers in particular industries, and organisation for "rationalisation," have compelled the establishment of uniform costing by industries for comparing relative efficiencies and as a means of controlling unit costs. To come nearer home, there is the case of the uniform costing system inaugurated by the Central Electricity Board for owners of generating stations operating under its control. That such a system was essential is obvious.

A further point is the desirability of uniform tariffs and methods of charging for supplies which is constantly before the industry and is one of the main reasons for the forthcoming reorganisation. So long as tariffs are expected to bear some relationship to costs, uniformity of costing methods should inevitably precede uniformity of selling prices.

Probably the outcome of any reorganisation of distribution will normally provide for the introduction of uniform costing methods by each supply authority or regional group. It is suggested, however, that this should be done now, for surely the appropriate time to assess undertakings as to relative efficiency is before the reorganisation becomes an accomplished fact.

[Jerome

Mr. Clifford Baron is commercial assistant in the Wolverhampton Corporation Electricity Department

Apart from the question in its wider aspects there are many reasons why individual undertakings should have adequate costing systems for their own purposes. The control of expenditure in all its phases is an important function of management and it is impossible to control cost unless there are facilities, in the first place, for analysing it in sufficient detail as and when it takes place.

This, of course, does not constitute the whole of the picture, for costing can be said to fall into two groups:—(1) Cost finding, and (2) the employment and interpretation of the costing information in the formation and guidance of policy. The first essential is, however, a routine system of adequate analysis of cost designed and coded so as to provide elasticity to permit of extensive or intensive *ad hoc* inquiry.

Whether or not any particular system is adequate may be just a matter of opinion, but it is suggested that management executives might, with advantage, ask themselves the following questions:—

Does our costing system provide sufficient details to enable a check to be kept on *all* normal operating expenditure? Does the information differentiate between the normal and the abnormal or special, and between fixed and variable overheads? Are the figures presented in a form which can readily be read and understood without waste of time? Is provision made for the circulation of cost data to the various sectional heads of the undertaking actually carrying out the work and therefore incurring the expenditure? Does the information presented and circulated to responsible assistants make adequate comparison of actual as against estimated expenditure, and are satisfactory explanations received in all cases where material differences occur? Is full use made of units of cost in presenting the data? Do we obtain the running costs of all jobs, etc., particularly of capital works, at short intervals as the work proceeds, *i.e.*, do the figures represent news or merely history? Could an *ad hoc* inquiry be made into *any* branch or class of expenditure over a period of time, or into the cost of any particular job, without causing an upheaval in the office through the necessity of a laborious search through quantities of original dockets? Is the accounting method based on double-entry principles to facilitate accuracy? Is there provision in the system for reconciliation and agreement of the figures with the books and accounts of the treasurer's department, thus ensuring that the costs are true costs? In fact, is our costing system designed for the use of the department to facilitate control, or does it merely consist of the allocation of expenditure under a few headings to enable the borough treasurer to compile the abstract of accounts?

There is little doubt that not many undertakings in the country could answer *all* the questions in the affirmative and that quite a number, in all honesty, would have to answer "No" to each of them.

Complacency and Cost

In any undertaking where only crude methods of costing obtain, or where no real attempts at all are made, the reason for the state of affairs is either (a) a lack of interest on the part of the management, accompanied, if and when the thought

obtrudes, by a complacent "we manage very well with what we've got," or (b) the assumption that the ideal system is beyond reach owing to the high cost and difficulties of obtaining the extensive clerical labour involved.

The first reason is to be deplored as management must be seriously handicapped unless satisfactory complete control of cost can be exercised, preferably co-ordinated with some form of expense budgeting. Inefficiency and wastage, whether of labour, materials or plant, can cost many hundreds of pounds per annum, the saving of which could contribute materially to the lowering of tariffs of charge, etc. Incidentally, in more cases than one, the unsatisfactory accounting arrangements have provided an excuse for the inroads made by the borough treasurer into this work of an undertaking.

As regards the second reason the solution rests in the mechanisation of the work. Many types of accounting machines are available for purchase and hire, but it is suggested that easily the best for costing purposes are the ma hines which operate on the basis of punched cards. Costing is primarily a question of analysis, and this type of equipment is speedy, very flexible and the cost of a battery of machines suitable for a large undertaking is roughly equivalent to a salary paid to one clerk for ten years.

The Powers punched card accounting system, for instance, is a completely mechanised system which can offer adequate facilities for purposes of complete cost finding and presentation of data. These machines perform the three fundamental operations involved in all costing work, *viz.*, the recording of the original data; sorting such data to the various analytical classified groups; printing the data in any form required on separately ruled sheets—at the same time adding and subtracting all necessary groups of figures.

A Mechanised System Described

The basis of the system is a thin, flexible card into which information is transferred by means of punched holes from original documents. Each hole, or group of holes, represents a specific fact and each card thus punched contains all the essential particulars relating to one costing transaction. Once the cards are punched and checked they become original accounting entries which can be mechanically sorted into the required order for analysis, printed and added. These punched holes cannot be erased or altered.

The complete battery of machines comprises the following units:—(1) An automatic key punch through which medium the cards are perforated. (2) A verifier which ensures the correct punching of the cards. (3) A sorter which automatically selects and arranges the cards in the order required to produce the desired information. (4) A tabulator which mechanically translates the holes in the cards and prints the information represented by them, at the same time adding, subtracting and printing sub-totals and totals as required.

The tabulations of information which can be speedily produced from the punched cards at set intervals as a matter of routine are many and varied. There is also ample provision for *ad hoc* inquiry, as full particulars of any specific item or job is obtainable for any period of time by merely extracting the appropriate batch of cards and running them through the tabulator.

The organisation of a mechanised punched-card scheme involves a departure from many of the preconceived ideas adopted where hand methods are in use but the objectives are precisely the same. A scheme of this type can be said to embody the principles of mass production in that each member of the personnel and each section performs one set of duties only, and the system should be devised accordingly with the work carried out to a definite time schedule.

It is not within the province of this article to attempt to define the nature or number of analysis sub-divisions of cost required by the management personnel of a modern supply undertaking for adequate guidance and control; until some measure of uniformity is adopted by all supply authorities, it will remain a matter of individual opinion. Suffice it to refer the reader to the questions on the matter which are set out earlier in this article and to state that the very high speed at which these machines operate, enables the number of subdivisions of analysis to be practically limitless. Wherever possible, precautions should be taken in designing the coding to make provision for dovetailing with such matters as the returns to the Electricity Commissioners with regard to expenditure under loan sanctions, and with internal estimate forms and general procedure.

Comparisons and Cost Units

The form which the presentation of cost data is to take is largely a matter for the decision of the recipient. Some executives like to pore over columns of figures whilst others are only happy when such information is pictorially represented by charts or graphs. Whether one method or the other is used, or a combination of both, it is essential that some means of assessing or measuring the data should be incorporated. Comparisons of operating results over a period with those of the corresponding period of a previous year or years, produce little of value in the way of information for management. Rapid expansion of the undertaking, with changing conditions, is bound to affect adversely the usefulness of such comparisons.

The best "yardstick" is undoubtedly the measurement of actual against estimated, always providing each estimate is prepared in some detail with careful thought and is visualised as a standard at which to aim. It is taken for granted that estimates are normally prepared in most undertakings for capital jobs such as mains extensions, the erection and equipping of sub-stations, etc., and for special revenue works, but even with many ordinary operating items, there is much to be gained in setting up standards in advance as an incentive to efficiency with economy.

The introduction of satisfactory cost units into the presentation of costs will always greatly enhance the value of the data. The kWh sent out is usually utilised for operating expenditure, and most normal revenue items are probably best expressed in these terms. At the same time, there are many other cost units that can be used with distinct advantage for some types of cost and the few typical examples set out hereunder may serve to make the point clear.

ITEM OF COST.	COST UNIT.
Total for new cooker installations, analysed under wages, material and transport.	Per cooker installed.
New assisted wiring installations, analysed under wages and materials.	For point wired for each different size of installation.
Testing meters, with totals for each type of meter...	Per meter tested.
Maintenance of transport vehicles analysed under petrol, repairs, depreciation, drivers' wages, etc.	Per mile run per vehicle.
Erection of each sub-station building	Per cubic foot of completed building.
Totals of general distribution capital expenditure, analysed between rural and urban.	Per consumer connected or units sold per £1 of capital.

The supply industry continues to make steady progress but I believe that the very nature and quality of the industry's commodity renders success comparatively easy of achievement. Success can breed complacency and complacency in its turn can restrict development to an enormous degree. Whilst "systems" as such can never take the place of executive ability and are subservient in essence, adequate costing facilities, intelligently utilised and applied, can play some part at any rate in the achievement of a universally cheap and abundant supply.

Early Power Applications

A READER has sent us a copy of "The Electric Transmission of Power," by Dr. Paget Higgs, published in 1879. A perusal of this suggests that the significance of voltage was not fully appreciated (volts are mentioned very seldom), most attention being paid to ohmic resistance. Current is expressed in terms of webers, and horse-power is taken as 0.75 ergten per second (an "ergten" being 10^{10} ergs).

After describing the dynamos then available, Dr. Paget Higgs came to the conclusion that to transmit electricity over long distances would be quite feasible with 48 per cent. efficiency, and he discussed water-power and pit-head generation.

Volts are not mentioned in the catalogue of the Royal Mining Engineering and Industrial Exhibition held at Newcastle-on-Tyne in 1887 (sent by the same correspondent), where "as many systems of lighting as could be conveniently brought together" were shown. Between 500 and 600 h.p. was distributed, requiring 1,000 i.h.p. "to keep the current flowing." Prominent among the exhibits were fourteen engines and dynamos supplied by Clarke, Chapman, Parsons & Co. Each engine was a succession of steam turbines, in which the steam entered at the centre, rotating on a common shaft with the dynamo which had an output of 30 h.p. at 9,000 r.p.m. The steam taken was automatically regulated "according to the strength of the field magnet."

Seven 18-h.p. dynamos by J. H. Holmes & Co., driven by Robey engines, lighted the dining and other rooms half a mile away with a loss in transmission of 14 per cent. Another exhibit was a Paris & Scott separately excited high-tension dynamo designed to light incandescent lamps at a distance of several miles; transformation was effected at the far end by a machine with a double winding on its armature. Other electrical apparatus shown included lamps of up to 1,000 c.p., welding plant, J. W. Swan's safety lamps, a tramcar, mine haulage plant, a drill and riveting machine (lent from a shipyard), motors with centrifugal governors, a battery-driven cab, fire alarms, bells and telephones.

Meetings and Discussions

This week we are able to deal with a variety of interesting papers. Three meetings of the I.E.E. are referred to. The Meter and Instrument Section heard a paper by Mr. C. W. Hughes on the organisation of a large meter-testing department; the Transmission Section received some data on Petersen coils from Mr. H. W. Taylor and Dr. P. F. Stritzl; and yesterday's ordinary meeting was devoted to a discussion on electrical engineering education. Other matters discussed at recent gatherings include pulverised fuel, light perception and electrical steel refining.

Meter Testing

IN a paper read before the INSTITUTION OF ELECTRICAL ENGINEERS (Meter and Instrument Section) on December 10th, Mr. C. W. Hughes dealt with the organisation of a meter test department with special reference to the Electricity Supply (Meters) Act, 1936. Only whole-current meters up to 30 A in capacity were dealt with.

In the first part the advantages and disadvantages of the three methods allowed by the Electricity Commissioners were discussed, and the conclusion was reached that while long-period dial tests using standard rotating meters (method A) secured greater accuracy, the other two methods (B and C) were less expensive when only a few meters of similar type were dealt with at the same time. In method B, the speed of the meter disc was compared directly with that of the rotating sub-standard meter at the specified loads, but in addition the meter must have one dial test at one of these loads as in method A. In method C, the load was held steady at the specified loads on an indicating watt-meter and the disc revolutions were timed, *e.g.*, by stop watch. An additional test by dial run must also be made at one of the given loads.

The superiority of method A was regarded as providing an argument in favour of standardising the sizes and types of meters bought by an undertaking and for the amalgamation of small test houses.

A successful procedure for "off-circuit" testing, overhaul and recalibration was outlined. Test benches for single-phase and polyphase meters and the requisite laboratory equipment were discussed. It was shown that for speed and efficiency some of the equipment required to comply with the Electricity Commissioners' Regulations should be duplicated and others added, such as an oscillograph to determine the wave form where distortion, due to load conditions on the consumers' premises or in the test room, was suspected.

A constant check on meter accuracies was advocated so that any one type of meter could be brought in for overhaul as soon as, but only when, necessary. A system of collating information regarding meter performance covering this aspect as well as tests on new meters was described in two important sections of the paper, which concluded with data regarding the cost of overhaul and testing by the methods advocated.

Arc-suppression Coils

OPERATION experience of line protection by Petersen coils, with special reference to conditions prevailing in Great Britain, was the subject of a paper read before the INSTITUTION OF ELECTRICAL ENGINEERS (Transmission Section) on Wednesday by Mr. H. Willott Taylor and Dr. P. F. Stritzl. The authors state that these coils eliminate the possibility of arcing earths as a result of applying a lagging current approximately equal and opposite to the capacitance earth current.

Owing to the inherent resistance of the coil, phase conductors and earth, there is always an active component in phase with the voltage of the faulty line, but except on large cable networks this is not important. There is also a reactive component, the magnitude and phase angle of which will depend upon how closely the coil is tuned and whether the earth capacitance current is over- or under-compensated.

Arc suppression is due to the delay in re-applying the normal voltage across the arc space after extinguishing, the tuned circuit continuing to oscillate at 50 cycles per sec., thus maintaining the conditions that existed before extinction, i.e., with the faulty phase almost at earth potential. Only the damping effect of the circuit resistance causes the gradual re-establishment of normal conditions after ionisation of the arc space has disappeared. Coils need not be installed on small networks where the leading reactive current does not exceed 4 A. Above that figure, with earth currents up to 100 A (corresponding to an 11-kV overhead system of 500 miles) an arc will be safely suppressed with the coil 30 per cent. out of tune, but for the highest voltages the permissible margin is 5 to 10 per cent., while on cable networks the most accurate tuning should be aimed at.

Most British systems are amply insulated from earth to permit a potential between the neutral point and earth which, coupled with the effect of a coil in eliminating heavy stresses due to frequent short-circuits, leads the authors to believe that a coil can be applied to almost every existing network without serious modification.

Most faults on overhead lines are earth faults of a transient nature and these are cleared, usually within half a cycle, by arc-suppression coils. When a fault is sustained the system can be operated with one phase earthed for the time being, if the coil is continuously rated, since the insulation to withstand lightning surges is enough to cope with the additional stress. With cables almost every fault starts between one phase and lead sheath; fault current can be reduced to a very low value by the action of a coil, and on a small network may not involve other phases for several days.

The authors hold that the danger of shocks to employés is diminished and that a large proportion of the injuries due to explosions of circuit-breakers, flash-overs of high-voltage apparatus and breaking of overhead line conductors would be avoided by the use of these coils. An 11-kV experimental coil was installed by Edmundson's Electricity Corporation in October, 1934. In consequence of its success, coils have been installed in thirteen other networks, including two at 33 kV, of the same concern, and will shortly be in operation on more than fifty networks in all in the United Kingdom.

Views on Training

A GENERAL discussion on "Electrical Engineering Education" at the INSTITUTION OF ELECTRICAL ENGINEERS was introduced last evening by Professor C. L. Fortescue, Col. H. C. Fraser and Mr. F. H. Clough. The objectives were defined by Professor Fortescue, who covered the period between the passing of the school certificate examination (or equivalent) and the starting of the three years of responsible experience required for associate membership of the Institution. The two-fold qualities required of a young engineer were, he said: (1) A knowledge of practice in his chosen branch with enough knowledge of modern languages for reading literature of his subject and enough grounding in science and mathematics to enable him to take part in its advancement, and (2) personal qualities of quick perception, good address, initiative, tact and purposeful honesty. These qualities were almost wholly inborn, but training should be such as to foster their development. A university course plus post-graduate apprenticeship he regarded as better than works and technical institutions. A longer time was available to students for acquiring a philosophic and fundamental outlook so that they would not merely accept facts without logical support.

Professor Fortescue outlined a complete but flexible scheme of theoretical training in five stages that was designed to encourage intellectual development and at the same time to provide a knowledge of principles and methods required for coping with practical problems as they arose. In this scheme present-day practice and design problems played a minor part and mechanical engineering (though not theoretical applied mechanics) was omitted. Laboratory work took an important place, but mainly as a means of developing a scientific outlook and powers of observation, and awards of degrees and diplomas should depend largely upon the manner in which laboratory work was performed.

Two types of practical training were also described—first, a four- to five-year apprenticeship for boys entering a works straight from school, and the other a two-year post-graduate scheme. The second of these was discussed. He attached little importance to the acquisition of manual skill by those about to take executive positions as he considered that these required, rather, a knowledge of the factors affecting production and costs, the effects of working conditions (*e.g.*, heating, lighting and ventilation) and trade union activities.

During the last year of practical training the student should be afforded an opportunity of studying intensively the methods adopted and the conditions prevailing in the branch he was to enter. For university students having the necessary gifts, he said he regarded one year of research in physics or engineering as at least equivalent to a year's works apprenticeship.

Col. Fraser took the line that development of character no less than mental efficiency must be the concern of the educational authority. There was, he remarked, no danger of the

importance of technical proficiency being underestimated to-day and the real technical expert was assured of an eminent position, but his concern was with the average engineer.

Technical knowledge was, he said, top-dressing to which a sound general education was the subsoil. He regretted a tendency to regard the acquisition of diplomas and degrees as proof that a candidate was likely to develop the energetic initiative and the wide knowledge of men and things that were required. The successful engineer must reach a high standard in these respects. First, he must possess the correct temperament; he must understand how to obey and be obeyed, and how to stand strain. Secondly, he must be adaptable to changing circumstances and be able to make rapid and sound decisions on inadequate data. Thirdly, he must be physically fit. These qualities had to be implanted at an early age; they should be allowed in certain cases to compensate for academic deficiencies.

Ability to think in a clear and analytical manner was regarded by Mr. Clough as the principal attribute of an engineer, with as much general culture as his other studies would allow and a good knowledge of at least one foreign language. The course of study could be divided into cultural, academic and technical periods leading to matriculation, intermediate B.Sc. and final B.Sc. A good arrangement, he believed, was for the student to enter a works after attaining the standard of the intermediate B.Sc., and after some laboratory experience at college; he would later resume his studies for the final B.Sc. and afterwards return to practical work.

In the manufacturing concern with which he was associated, preliminary selection of apprentices was made by visiting colleges, the final choice being decided by interview. Those selected were given a start in a general department of the works, proceeding thence to others according to the type of work in which they would ultimately be engaged, including the drawing office, commercial departments and laboratory. Half-hour talks were given by specialist engineers during the winter and students with degrees could attend a post-graduation course in the local technical college.

Technical studies, Mr. Clough considered, should be confined chiefly to fundamentals using practical applications of the principles as illustrations only. Examinations had the merit of providing a definite goal to work for, but they tended to limit the range of subjects covered. An examination might well be set in which the student was given all the books of reference he might need, as this would represent most closely conditions in later life.

Electrical Steel Refining

A NEW type of high-frequency furnace was described by Mr. V. Stobie in a paper presented on December 11th to the INSTITUTE OF BRITISH FOUNDRYMEN. He first laid down four conditions which appeared to him to provide a solution for the successful refining of steel: (1) A slag line higher than the superheated crucible wall and not within the heating zone of the furnace; (2) a much thicker refractory lining at the raised slag line than in the crucible wall; (3) a slag line that could be repaired after each heat; (4) a reduction in the surface turbulence due to electricity.

The furnace described resembles the ordinary type in and around the lower half, but the induction coil does not extend above the surface of the molten bath but finishes lower down; above the coil the lining is thickened to 9 in. or more and slopes on its exposed surfaces. The furnace roof is of sillimanite. The reason given for the efficacy of the shorter coil is that the power factor is higher.

The steel charge above coil level is said to be maintained at the same temperature as the remainder of the bath due to convection and the upward flow of the turbulent fountain, while the weight of the steel above coil level spreads out the undesired portion of the fountain before it can over-agitate the surface, providing the final requirement for good refining.

It is claimed that carbon content can be reduced to 0.02 per cent., that silica, manganese, sulphur and phosphorus are reduced at the same time and that no analysis need be taken to indicate the progress of refining.

Owing to the low carbon content obtainable it is anticipated that the furnace will be especially useful for producing silicon steels with low hysteresis loss and nickel steels for other electrical purposes. The advantage of a refining high-frequency furnace lies not only in the virtual elimination of carbon, when desired, but also in exactitude in modelling steel and other metals to requirements.

Light Perception

THE Thomas Young Oration of the PHYSICAL SOCIETY was delivered on December 9th by Dr. R. J. Lythgoe, who discussed the structure of the retina and the rôle of its visual purple.

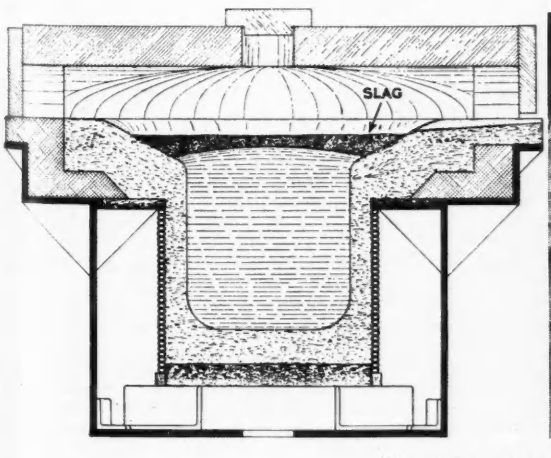
The key to the understanding of the processes by which the energy of a light wave caused impulses in the optic nerve lay, he said, in the retina, the anatomical details of which were imperfectly known. As a result of recent work, however, views of the rods (structures of the retina responsible for vision at low illuminations) had been modified. Visual purple, the light-sensitive substance found in the rods, might be adsorbed on their surfaces, and a large number of rods, by increasing the quantity of visual purple, would improve vision at low illuminations. True solution of the substance was probably obtained only when the rod envelope was completely disintegrated. The increase in visual purple would not have a great effect on animals living at great depths of the sea where only a narrow band of wavelengths was transmitted. Day-hunting species of monkeys had a cone type of retina and night-hunting forms mostly rods, while in addition the retina was lined with tapetum which appeared to reflect light back on to the rods.

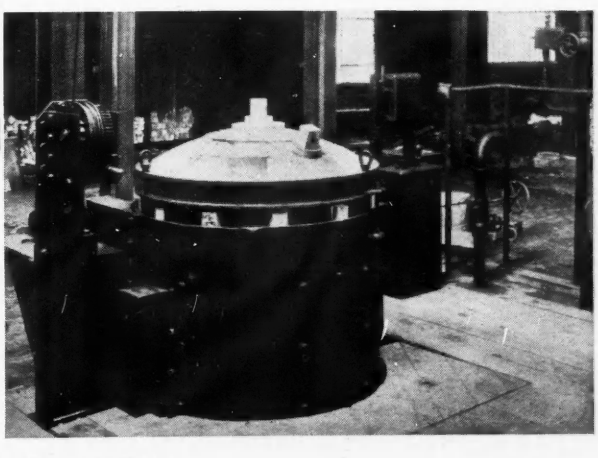
Recent work on visual purple had shown the quantum efficiency of the "bleaching" process to be about unity; in addition, visual purple had a high extinction coefficient. Photochemically light produced a maximal effect on visual purple. The bleaching of visual purple by light did not result in colourless products, but in a yellow substance with acid-base indicator properties with, probably, other intermediate products. These coloured breakdown products in high concentration might considerably modify the perception of light of different wavelengths and, if present in concentrations of 100 of the yellow substance to one of visual purple, would probably shift the wavelength of maximum luminosity from a scotopic value of 505 mμ or so to a photopic value of 515 or 520 mμ.

Powdered Fuel for Boilers

IN a paper before the INSTITUTE OF FUEL on December 9th, Messrs. T. F. Hurley and R. Cook described tests on a Lancashire boiler carried out as part of the fuel research programme of the Department of Scientific and Industrial Research. As the ratio of surface to volume is high in a Lancashire boiler large heat releases can be obtained, while the effect of this high ratio in reducing combustion efficiency can be counteracted by rapid ignition and controlled mixing of fuel and air.

The boiler employed was a standard John Thompson dish-





The Stobie high-frequency furnace

ended type, 28 ft. by 7 ft. 6 in., rated at 5,000 lb. per hr. and fitted with superheater and soot blowers, but without economiser or air preheater. Two types of burners, the grid and the multi-jet, designed at the Fuel Research Station, were used. Fuel was fed to the furnace on the bin and feeder system, and special arrangements were made to augment fuel, air and water supplies. Northumberland steam coal was used, having a volatile content of 35 per cent. and an ash content of from 4.1 to 8.1 per cent. Maximum efficiency required the highest CO_2 content (usually 14.5 to 15.5 per cent. at the dampers) that was compatible with a low percentage of combustion matter in the fly ash.

Loads in four tests with each burner (details of which are tabulated in the paper, together with graphs showing the heat balances) were 235 per cent. with the grid type and 247 per cent. with the multi-jet type calculated on actual evaporation. Regarding the whole of the furnace tube as combustion chamber, the minimum heat release would be 68,900 B.th.u. per cu. ft. per hr., as against 30,000 to 40,000 for a modern water-tube boiler. Flue-gas temperature in the superheater chamber was high enough to cause the steam temperature to reach 680 deg. F. At the damper the temperature, even at rated load, was high enough to suggest the need for further convector heating surfaces in the boiler or in the form of an economiser or air heater.

Gross thermal efficiencies at rated load of about 80 per cent. with the multi-jet and 75 per cent. with grid burners were reached, the higher figure in the former case being due to more intimate mixing of air and fuel and higher furnace temperatures. At greater loads the difference became less, and after 11,000 lb. per hr. (when the figure decreased to 69 per cent.) results were in favour of the grid burner.

Loss due to unburned flue gases was negligible at all loads; the principal heat loss arising from incomplete combustion is that caused by unburned carbon in the fly ash, but with the fuel used this was small compared with the sensible heat carried away by the flue gases. A large proportion of the latter could be recovered by the installation of auxiliary heating surface, and it should be possible to operate a Lancashire boiler of this size at from 2,000 to 15,000 lb. of steam per hr. with an efficiency of about 80 per cent. over the whole range. This estimate has been borne out by results obtained during a six-hour trial of a commercial installation.

The high loads obtained are believed not to have been detrimental to the plant in any way. No trouble was experienced with the brickwork lining of the furnace with the grid burner, but skill was required to prevent slagging with minimum air when the multi-jet burner was used.

Lightning Protection

MR. E. T. NORRIS, addressing the London Branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS on December 7th, said that recent studies with the cathode-ray oscillograph and the high-speed revolving camera had resulted in the discovery of the leader stroke formation and other major characteristics of great importance in determining the effect of lightning upon electrical power transmission whether as induced surges or as direct hits. Considerable work had also been done both experimentally with the aid of the high-voltage surge generator and cathode-ray oscillograph, and theoretically by mathematical studies.

The practical aspect was twofold, *viz.*, lines and electrical apparatus. Lines were subjected to induced surges or direct hits, the former being of importance only for relatively low voltages. Direct hits might occur either to the conductors or to the supporting towers and might be reduced by shielding the lines with earth wires and by employing line insulators which would withstand flash-overs. The Petersen coil did not deal with a surge, but prevented a power arc following a surge. The de-ion gaps acted similarly and, being cheap, were often installed on every tower.

Damage to electrical apparatus at the ends of the lines was generally the result of direct hits due either to the wave front steepness or to voltage amplitude. A sub-station could be shielded from lightning strokes by a protective network connected to earth wires above the line. For the higher voltage lines the earthed network should be continued along the lines, for perhaps a mile, to deal with surges created by lightning travelling towards the station from a distance.

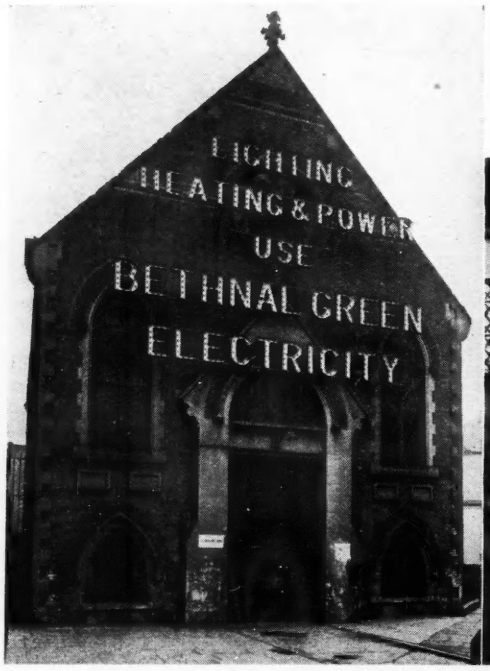
In the flash-over of bus-bars, bushings and insulators, the amplitude of the surge was of major importance, but for transformer and machinery windings steepness of wave front was more important. Lightning arrestors reduced the amplitude of the surge, and surge absorbers and other forms of wave modifiers flattened the front of the wave. A rod gap or weak link reduced the amplitude of a surge, diverting a flash-over from a bushing or bus-bar insulator to a gap where it could not cause damage. The degree of protection desirable depended not only upon the importance of the supply, but upon the cost of the apparatus involved, the prevalence and severity of lightning storms, and the existence of a duplicate supply.

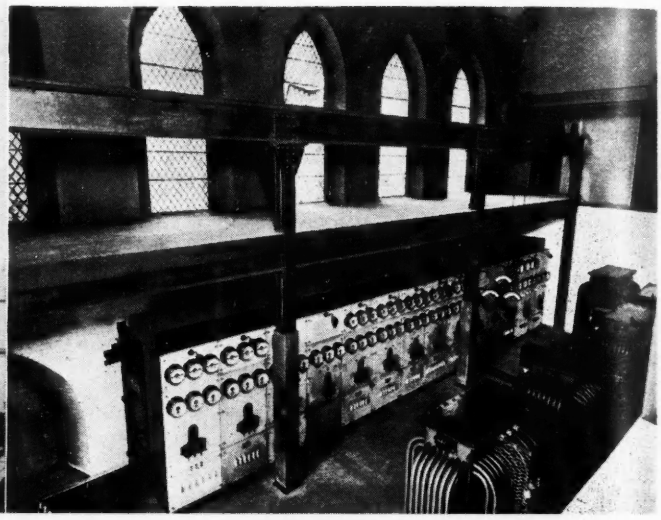
During the subsequent discussion, Mr. Norris, replying to a question by Mr. Shipley as to whether a transformer could be built embodying within itself the means of preventing damage from a surge, said that the design of such a transformer was more an economic than a technical problem. Many arrangements for improving the winding surge strength of a transformer had proved effective.

Mr. J. R. Cowie mentioned the theory that if the attachment of the line to the top of the insulator gave a well distributed stress instead of a point stress, an arc-over would not occur.

Mr. Norris doubted whether the levelling of stress distribution along the insulator would prevent flash-over arising from a direct hit.

Mr. Shipley stated that serious damage had been done at a sub-station about twelve miles from a lightning stroke because the latter was propagated along the armour of the cable and the reinforcement in the concrete wall had not been earthed to a steel structure at the sub-station.





Except for the sign on the outside no one would guess that this was a sub-station. Situated at the Oval, Hackney Road, Bethnal Green, it was a Lithuanian Church until the local Electricity Department converted it to its present use. Apart from the switchboard and transformers seen in the illustration below, there is another switchboard situated in the balcony. (See "Electricity in the East End," p. 845)

[Elec. Rev. photos.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

E.D.A.'s Christmas Advertising

With reference to Mr. E. Salmon's letter in your issue of December 10th, I would like to mention that the average price of an iron by a "reputable" manufacturer is approximately 10s. 6d., as anyone in the trade knows. This may be due, not to superior materials and finish, but to heavier expenses in connection with advertising and/or higher wages.

Is it fair for the undertakings, whose main concern is load development, to support the non-advertising and therefore low-priced manufacturer and reap the benefit of the seeds sown by the national advertising of the well-known firms?

I would like to point out I am in no way connected with the E.D.A. or any manufacturer. D. GODOLPHIN.

Reading, *December 10th.*

I was pleased to see Mr. Salmon's letter on this subject in last week's REVIEW, but these ridiculously priced advertisements, admirable as they are in other respects, have been appearing for months and have probably lost as many potential sales as they have made.

The prices appear to be taken from price lists but the products of some manufacturers of good quality and much lower price, which are being handled by reputable wholesalers and retailers, are overlooked. Week after week the public are told in these advertisements of, for instance, vacuum cleaners "from £8 15s," while alongside is probably a stores advertisement showing cleaners at 49s. 6d. Even confining ourselves to good quality machines sold through the legitimate electrical trader surely we all know and can recommend vacuum cleaners at far less than £8 15s. The same applies to irons, kettles—in fact, everything in the E.D.A. advertisements.

It was largely due to reading them that at a meeting of contractors, factors, manufacturers' representatives, and the City Electricity Department held recently in Norwich to form an Electrical Development Circle, that I successfully opposed affiliation to E.D.A., at least for the time being. An E.D.A. with the objects stated in its literature should advertise current-consuming appliances at from the minimum prices for reliable goods, in the knowledge that the majority of consumers are raising families on less than £5 a week. H. BELBIN

Norwich, *December 13th.* (*Electrical Conduits, Ltd.*)

Static Charges on Aircraft

Recently an aeroplane was damaged due to a charge of "frictional" electricity at a high voltage. It is well known that there is a discharge from fine points and I suggest, therefore, that a few spikes connected to the metal work of the craft might automatically prevent most of the accumulated charge.

In this connection I would refer to a letter which you published after the Zeppelin disaster, proposing that a committee should be set up to consider the effects of atmospherics on aircraft. W. H. LAWES.

Manchester, *December 11th.*

Earth Leakage Trips

In reply to Mr. Cameron Brown, may I point out that he starts off with a wrong premise—the voltage across the trip coil should be of the order of 15 V, and the potential mentioned, 65 V, is the total drop across the coil and the 800 ohms earth electrode. I think this will affect his further conclusions.

It is essential that some compromise be made between the theoretically desirable limitation of leakage potential and the equally important matter of certainty of operation in practice, coupled with robust construction of the device. The early failures with leakage trips in Germany were due to the fact that the men responsible for the development of the system attempted to reduce dependence upon the electrode to almost vanishing point, with the natural result that the apparatus proved unreliable in practice and too delicate to stand up to practical conditions. Whilst all will agree that a voltage limitation to 10 V would be ideal, yet some wattage must be available to work the mechanism of the trip, and the undue limitation of current (I.E.E. Regulation 1005 C) and voltage (Mr. Taylor and Mr. Cameron Brown) militates against this.

It will be useless equipping our rural installations with apparatus which is theoretically perfect, yet fails to operate under the usual conditions met with in practice. A limitation of current to 30 mA and voltage to 30, against 800 ohms electrode resistance, affords only small power to trip a circuit-breaker.

There must surely be something wrong with Mr. Cameron Brown's installations if the steel framework of farm buildings can attain a potential independent of the earth electrode. It is usually found that either these frames are designedly attached to the electrode or to the circuit to be protected, that is, the motor frameworks or switchgear casings, and not left floating in the air.

In further reply to Mr. Taylor, I shall be very pleased to have the further information that he promises, but would point out that there is already a surfeit of theoretical opinions on this matter. What I am seeking is a well-backed report of practical experience on the point, which I hope will fully confirm the extensive experiments which I have carried out, and the more valuable experience of engineers abroad who have concentrated on the work for the past ten years.

By the way I note that two errors have crept into my article "Protection for Motors," in your current issue. In the second paragraph under "Comparative Efficiencies" the sentence should read: "Two overload trips, magnetic, with thermal releases for low, long-period overloads, *and* a low-current leakage trip." Line 6, second column, should read: "50 mA and 30 *amperes.*" T. C. GILBERT.

Folkestone, *December 11th.*

Motor Starting Regulations

Some two years ago, a small booklet was jointly published by the B.E.A.M.A. and the I.M.E.A. dealing with supply authorities' regulations applicable to the starting of squirrel cage motors. This booklet was issued in an endeavour to clarify the chaotic condition of these regulations.

At the present moment little improvement in the matter seems noticeable. It would be interesting to hear whether undertakings and manufacturers have shown willingness to co-operate in the matter, and whether any improvement in the future is likely. R. W. TOWERS.

East Twickenham, *December 13th.*

A Three-phase Phenomenon

With reference to the article upon phase reversal in your issue of December 3rd, we have on two occasions experienced an apparently large increase in voltage to earth, when one phase only has blown on a three-phase, delta-star, 11,000/400-V transformer, protected by fuses only on the 11-kV side, on the opened phase. This phenomenon has in all cases occurred when there has been about 200-400 yards of cable between the transformer and fuses and is not observable on opening an isolator at the transformer. The discharge is audible at the transformer, pole box and fuse.

I should greatly appreciate an explanation of this as I cannot myself produce one, even assuming the presence of third harmonics, unless there is some large capacitance in circuit that I have overlooked. JOHN W. GALLOP.

Bournemouth, *December 8th.*

The Resistivity of Water

With reference to Mr. Bullen's letter of December 6th the very low conductivity of the condensate of certain power stations is due to the fact that the whole process is carried out in a closed circuit (with "make up" from evaporators) from which impurities have gradually been eliminated. When a new plant is brought into operation, the conductivity of the condensate is very much higher, and it may take weeks of running before the conductivity can be brought down to a figure of one unit. If a sample of the condensate is drawn off in an open clean vessel and then tested, it will be found to have increased in conductivity by several units owing to absorption from the atmosphere of impurities which dissolve in the water.

The low conductivity observed is, in my experience, not due to the cause Mr. Bullen suggests. If any colloid comes over from the feed water into the turbine and condenser, it carries with it some impurity which reveals its presence in the condensate by an *increase* in conductivity.

In a number of power stations where it is desired to keep close observation on the quality of steam, with a view to keeping down corrosion of the turbine blades, a small quantity of steam is tapped from the steam pipe line and condensed, the water being passed through a "Dionic" purity meter. This immediately shows by an increase in conductivity if any impurities are coming over. EVERSHED & VIGNOLES, LTD.

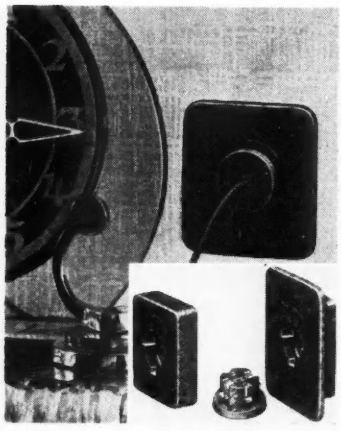
W. A. VIGNOLES, *Managing Director.*

London, W.4, *December 13th.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Fused Clock Connector



The Sanders fused clock connector, showing the relative size and method of assembly

A recent introduction by WM. SANDERS & CO., LTD., Falcon Electrical Works, Wednesbury, is a fused clock connector available in both surface and sunk types as a complete unit ready for installation. Although the live contacts are effectively shielded so that accidental access to them is virtually impossible, the fuse, which is situated in the socket, can be quickly replaced, as it is automatically withdrawn with the plug. When in contact, the plug is locked in position. The surface-type unit has a total projection of ¾-in. Both this and the sunk type are made of bakelite with a walnut finish.

This plug and socket is designed as a permanent connector with facilities for the safe and ready replacement of the cartridge fuse with which it is fitted, and should not be confused with plug and socket outlets made to B.S.S. which are also manufactured by Wm. Sanders. In order to facilitate the entry of the main cables the sockets are provided with three knockouts, one being situated at the bottom, one at the top and one at the side.

A Compact Source of Ultra-violet Light

The "Philora" black-bulb 80- and 125-W mercury lamps introduced by PHILIPS LAMPS, LTD., 145, Charing Cross Road, London, W.C.2, are a development of the ordinary lamps of this rating and type. The small quartz tube in which discharge takes place is enclosed in a glass bulb of normal shape made of Wood's glass, which permits the passage of ultra-violet rays, but absorbs nearly all the visible rays. The principal line radiated has a wavelength of 365 millimicrons.

The "Philora" black-bulb mercury lamp

These lamps are for a.c. operation only, in conjunction with the usual control gear normally used with the "Philora" mercury-vapour lamps. They are intended to provide a convenient source of ultra-violet light for industrial research purposes, *e.g.*, the commercial examination of foodstuffs, fabrics and various materials, and in advertising in conjunction with fluorescent paints which convert the ultra-violet light into visible rays.

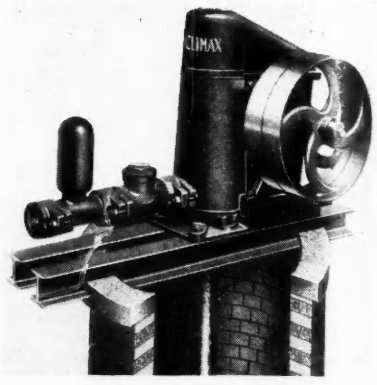
6-kV Plug and Socket

For connecting up cathode-ray tubes required for television and electro-medical and other high-voltage laboratory apparatus BELLING & LEE, LTD., Cambridge Arterial Road, Enfield, Mdx., have produced a high-tension plug and socket of moulded bakelite. The spout entry of the plug can take c.t.s. cable up to 9 mm., which, it is claimed, can be handled with safety on circuits at 6 kV, which is well below the limit at which corona starts, *viz.*, about 7 kV a.c. peak or 10 kV d.c. The fitting can be supplied for either live flex and dead chassis parts or, with a recessed contact in the chassis member, for the reverse condition, thus lending itself to television work.

The Belling-Lee 6-kV plug and socket

Deep-well Pumps

The latest oil-bath power head for deep well pumping made by THOMAS & SON, LTD., Climax Works, Worcester, is the "Climax" No. 28H. The pinion shaft, large end of the connecting rod and the plunger rod connection are fitted with self-aligning ball bearings, this type of bearing also being employed in other parts of the mechanism subject to friction.



The "Climax" No. 28H deep-well pump

In order to balance the work done on the up and down strokes, and consequently provide more uniform delivery, a differential plunger is incorporated. The gears are cut from the solid, and the cast-iron duplex spur wheels are extra wide; the steel pinions are cut from solid metal integral with the shaft.

For situations where deep wells and boreholes are situated in the basement of stores, offices and buildings where silence is essential, helical gears can be provided.

These sets can be supplied with pressure tanks, &c., forming self-contained pressure outfits, enabling a predetermined water pressure to be maintained. Such plant is entirely automatic in action.

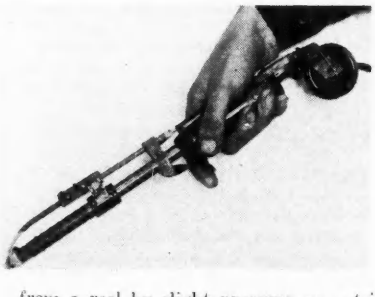
A Valve Amplifier

The latest valve amplifier to be marketed by the GENERAL ELECTRIC, CO., LTD., Magnet House, Kingsway, London, W.C.2, is available in five forms. The chassis is a metal disc assembly, obtainable with or without a ventilated metal covering box; or in panel form drilled ready for mounting on a standard rack. The transportable model is in an oak case with a carrying strap, while another oak cabinet is a combination with an electrically driven gramophone turntable and pick-up. In the last-mentioned case the motor increases the 125-VA demand from the mains by 20 VA. The a.c. output is 14 W, claimed to be linear within ±1.5 db. between 50 and 10,000 cycles. The three-stage gain is 90 db. or 28.9 db. for two stages.

Beside the mains switch and volume control, there is a three-position switch for selecting microphone, gramophone or radio input. It provides preliminary gain for the microphone by automatically bringing in the first stage. This is resistance-capacity coupled to the second stage which is in turn resistance-capacity-transformer coupled to two output valves operating in push-pull; triode valves are employed throughout. Separate pairs of terminals at the rear provide an alternative (normally short circuited) to enable the microphone output to be mixed with, or superimposed on, the gramophone reproduction when desired.

The moving coil microphone and its built-in transformer are matched, no energising current being required. The output is through a multi-ratio transformer designed for matching any normal loud-speaker grouping with a variety of low and high impedance tappings.

Automatic-feed Soldering Iron



The "Runbaken" soldering iron

RUNBAKEN PRODUCTS, 280, Deansgate, Manchester, are making an automatic soldering iron.

The iron is heated in the usual way by means of a resistance, but the solder is fed from a reel by slight pressure on a trigger so that only the correct quantity is melted at a time, thus reducing the time taken to carry out soldering jobs and resulting in a saving in solder.

New Books

Transient Electric Currents. By H. H. SKILLING. Pp. 349; figs. 85. London: McGraw-Hill Publishing Co., Ltd. Price 25s. net.

This book is written essentially from the viewpoint of the engineer and it is an unusual one of its kind on account of the preponderance of explanatory text over mathematical expressions. The latter are, of course, essential to the precise investigation of transient phenomena, but a plethora of them often is conducive only to discouragement of sustained study.

The book opens with an introductory exposition of the transient state, which is followed by five chapters on the behaviour of inductance and capacitance, circuit equations, the complete single circuit, and networks; these all refer to the d.c. excitation of circuits having lumped parameters. Other chapters discuss the transient response of circuits to alternating voltage, and transients in d.c. excited coupled-resonance circuits and in circuits with variable parameters.

Travelling waves in transmission lines having distributed parameters are studied with special reference to reflection phenomena. A final chapter on operational methods of analysis and an appendix on different forms of oscillographs complete the book.

This work forms an important link in the chain of engineering textbooks on electric transients. There is a vast amount of matter scattered throughout the journals of the various professional bodies and the technical Press, but the number of books presenting orderly studies and surveys of the subject is small. The present one is, therefore, doubly welcome—on its own merits and because we hope it will be the means of inducing other qualified writers to publish complementary works. There is a considerable need for these.

Television Engineering. By J. C. WILSON. Pp. 492; figs. 276. London: Sir Isaac Pitman & Sons, Ltd. Price 30s. net.

Almost without exception the many books hitherto published on television have been written in a popular style, giving little more than simple descriptions of the fundamentals underlying the practical application of the many devices necessary to successful transmission and reception. This book is one of the first attempts at a comprehensive textbook on television, dealing with the theory and practice from the technical standpoint and couched in ordinary engineering terms.

In addition to a purely historical chapter, the author refers to a large and varied number of devices, both old and new, although most have fallen into disuse or disfavour. No fewer than twenty-nine focal-plane scanning systems and a like number of non-focal plane methods are tabulated. Throughout the book chapter references are given under numerical cross-references, which form a useful and valuable addition by thus giving the sources of both data and detail.

The illustrations and diagrams are good and clear. Mathematical terms and formulæ are clearly set out (with or without trigonometrical functions), as also are the ten appendices. The bringing together under one cover of numerous graphs, useful for reference, as well as many waveforms should be a great convenience to the worker in this wide field. The most notable omission is that of electron cameras, which are merely briefly referred to in passing.

Considered as a whole the book is a very fair survey of the theoretical and practical aspects of television, covering, in particular, scanning methods, optics, photo-cells and cathode-ray tubes, and dealing with most systems of international repute. It can be recommended with confidence to the skilled technician in this expanding industry of television as well as those seriously studying these and allied subjects, for it is written around sound engineering principles.

The Fine Structure of Matter. By C. H. DOUGLAS CLARK. Pp. 216; figs. 124. London: Chapman & Hall, Ltd. Price 15s.

This volume is one section of a treatise on atomic and molecular structure, with the results of modern crystallography and allied matters for its special subjects. The treatment given to these is remarkably full and condensed, except that practically no reference is made to details of experimental procedure. The first chapter, a short one, contains a summary of the principal geometrical consequences which follow from the conception of the crystal lattice, with a passing reference to the Bragg X-ray equation. The second chapter is an account of the crystal structure of the elements, and the three succeeding ones deal with the structure of inorganic compounds. Compounds not included in one of the two main types are classified according to the number of atoms in the molecule, a procedure which is at least convenient for reference. The sixth chapter is on organic crystals, the seventh on colloids and amorphous substances, and the last two on alloys and similar systems, and on crystal structure and molecular constitution.

Mr. Clark's book is likely to be used mainly as a work of reference, although for a certain class of student a bare presentation of facts, such as is given here, is the best approach to a subject. Even the specialist will find in it, however, much that is stimulating and suggestive. The impression left after working through it is that the greatest interest attaches at present to the study of the less regular forms of matter, particularly liquids, materials like fibres, and alloys. In fact, astonishingly little seems to be really known about ordinary liquids, and perhaps even less of that curious class of bodies of which liquid crystals are the most familiar. With alloys, and metallic conductors in general, one is on rather more definite ground, particularly when the recent work of the Bristol school on the quantum theory of metals is taken into account.

The book is well prepared, with many good diagrams. It contains a wealth of references to the original literature, classified systematically, and an author index takes up twenty-four pages.

Generation, Transmission and Utilisation of Electrical Power. By A. T. STARR. Pp. 486; figs. 400. London: Sir Isaac Pitman & Sons, Ltd. Price 18s. net.

This book is one of the publishers' Engineering Degree Series and the author's aim has been to cover in a single volume the syllabus on "electric power," to which students working for an engineering degree or diploma must conform. Being a member of the staff of Faraday House as well as an experienced writer, the author is well fitted for the task, as the results clearly show.

Generation is accorded a single chapter only, utilisation is given three chapters, economics are dealt with in one chapter, while the remaining nine cover transmission, switchgear and protection, and surges. Five appendices are included, two of which, on alternating currents and on transformers, seem distinctly out of place in that position.

In the transmission section both overhead lines and underground cables are dealt with and the principles of voltage regulation stability are discussed with special reference to voltage control by various methods. There is a useful chapter on short-circuit calculations, including the method of symmetrical components, which is confined almost entirely, however, to radial systems. The chapter on switchgear and protection is stronger on the latter side and could, with advantage, be elaborated. The chapter on surges is largely academic in treatment, and illustrations of horn-gap arrestors should find no place in a modern textbook. Utilisation is accounted for by chapters on illumination, electric traction and various industrial applications.

The book is unquestionably a useful one, judged from the standpoint from which it is written, and its defects are, no doubt, those of the "electric power" syllabus.

Shorter Notices

"Conveying Machinery," by W. H. Atherton (London: The Technical Press, Ltd., price 21s.), is a record of first-hand experience, the author having been responsible for the construction of many of the conveying plants described. No attempt has been made to write a complete treatise covering all classes of handling appliances, but, nevertheless, many important types of conveying plant have been dealt with in a systematic manner. A chapter describing numerous types of conveying chains and their application should prove useful to both designers and users of conveyors and elevators, and a table of densities of bulk materials is also included. The text is amply illustrated by diagrams, scale drawings and photographs.

"Hydraulics and the Mechanics of Fluids," by E. H. Lewitt (Sir Isaac Pitman & Sons, Ltd., London, price 10s. 6d.), has now reached its fifth edition. The book covers the syllabuses of the B.Sc.(Eng.), Inst.C.E., and I.Mech.E. examinations in this subject, and the present volume has been made necessary by the new theories on fluid flow which have been evolved, chiefly due to the development of aeronautics, within recent years. The work has been considerably enlarged by the addition of two new chapters, one dealing with aerofoil and the other with the boundary layer theory, while sections on the hydraulic jump, the syphon spillway and the Kaplan turbine have been extended.

"The Effect of Impurities in Copper." By S. L. Archbutt and W. E. Prytherch. (Pp. 134; figs. 44.) London: British Non-Ferrous Metals Research Association. Price 12s. 6d.—A condensed account of investigations undertaken for the Association at the National Physical Laboratory, forming the fourth of a series of research monographs. A curve is included showing the effect on conductivity of the inclusion in the metal of various elements.

"Railways and the State: The Problem of Nationalisation." By Ernest Short. (56 pp.) London: British Railway Stockholders' Union, Ltd. Price 1s. This is a study of the results of nationalisation of the railways in a number of countries. Although it is an unbiased survey, a foreword by Sir Charles Stuart-Williams, chairman of the B.R.S.U., leaves no doubt as to its purpose.

"Retail Selling," by Gladys Burlton. Pp. 125. London: The Burlton Institute. Price 2s. This book was first published ten years ago at 5s. and now appears in a popular edition. It is particularly addressed to shop assistants, but will also be found useful by principals and managers, as well as members of the selling staff.

"Electric Wiring," by W. S. Ibbetson. (Fifth edition.) Pp. 260; figs. 135. London: E. & F. N. Spon, Ltd. Price 6s.

"Glass Working for Luminous Tubes," by H. Eccles. Pp. 143; figs. 34. London: Blandford Press, Ltd. Price 5s.

"Steels for the User," by R. T. Rolfe. Pp. 280; figs. 90. London: Chapman & Hall, Ltd. Price 21s.

Electricity for the Treforest Estate

REALISING that one of the first essentials for modern industry is a cheap and adequate supply of electricity, the South Wales and Monmouthshire Trading Estates, Ltd., made arrangements early in the development of the Treforest Estate, near Cardiff, for a bulk supply to be taken from the South Wales Electric Power Co.'s generating station at Upper Boat at a price which enables either h.v. or l.v. supplies to be given to tenants at very attractive rates. The Trading Estate is not a profit-making concern and as an example of the charges, a tenant taking a l.v. supply for power and lighting under a two-part tariff would pay £4 5s. per kW of maximum demand per annum plus 0.26d. per kWh. For over 400 kW of maximum demand the kW charge is £3 17s. 6d. Attractive terms are offered for floodlighting and other off-peak requirements.

The elongated shape of the estate with the River Taff running through it makes it necessary to divide the electrical distribution into two separate parts. Accordingly two transformer sub-stations, identical in design and suitable for an ultimate load of 3,000 kVA with 1,000 kVA as standby plant, have been constructed at central points to deal with the whole of the load in their respective areas. Initially the north sub-station is being equipped with two 1,000-kVA and the south sub-station with three 1,000 kVA B.T.H. transformers, one in each case being arranged as standby. If necessary a further sub-station will be erected.

Duplicate 11-kV feeders (Edison Swan 3-core, 0.25 sq. in., p.i.l.c., steel tape armoured) have been laid between the switch control house at the generating station to the north sub-station, whence duplicate h.v. feeders (0.2 sq. in.) are also laid to the south sub-station. In both sub-stations the h.v. switchgear controlling the incoming and outgoing supplies is of the duplicate bus-bar oil immersed type of 250,000-kVA rupturing capacity. Metering apparatus is fitted on the h.v. side, and, since the Estate is bound to maintain the power factor at not less than 0.8, meters of the Westinghouse ball gear type give a record of the kWh, the kVA hours and the p.f.

The h.v. switchgear at the north sub-station is provided with an incoming panel for the two 0.25 sq. in. feeders with duplicate bus-bars suitable for the total bulk supply and with the necessary panels for the h.v. side of the transformers. Two outgoing h.v. panels feed the south sub-station, and space is provided for future additions. The south sub-station is similarly equipped except that there is no outgoing h.v. main. All the main switchgear is of G.E.C. construction.

The 1,000-kVA transformers are of standard design fitted with Buchholz alarm relays.

The l.v. switchgear is of the standard totally enclosed iron-clad oil immersed type of 25,000-kVA rupturing capacity. The standard 400/230 3-phase supply is arranged for a four-wire system of distribution. From the north sub-station the outgoing feeders are generally arranged for a load of 500 A, but at the south sub-station the outgoing circuit-breaker controlling the supply to one large consumer is of 1,500-A capacity.

A street lighting control panel is included at each sub-station, switching being under the control of self-winding time switches. The street lighting circuits are connected to a fifth core in the main l.v. feeder cables and to the neutral conductor.

The distribution network has been carried out mainly with the same size of cables, the largest having 0.4 sq. in. cores. To make the network as flexible and comprehensive as possible a semi-ring main system has been adopted. The feeders taken round a selected area terminate at street type distribution kiosks forming distribution boards for relatively small circuits mainly for the small factories. In both the water and sewage pumping station on the estate the pumps are electrically driven.

An interesting feature of the scheme is the supply to one important consumer of low-pressure exhaust steam from the South Wales Co.'s generating station for process work, heating, &c. The capacity of the steam transmission system is to be increased to permit similar supplies to other tenants.

Parliamentary News (BY OUR SPECIAL REPORTER)

Transmission Line in Borrowdale

In the House of Commons on December 9th Major Dower asked the Minister of Health if he was aware that it was proposed to erect an overhead line along Borrowdale which would seriously disfigure one of the most beautiful valleys in Cumberland, what would be the lowest extra cost of laying a cable underground, and what steps were being taken.

Mr. Burgin, who replied, said that an application by the Mid-Cumberland Electricity Supply Co., Ltd., for consent to erect an overhead line along Borrowdale had been received and was under consideration. If an inquiry was held into the application the extra cost of laying the cable underground and all other relevant considerations would be taken into account.

Hire-purchase Bill

On December 10th the Hire-Purchase Bill was read a second time in the House of Commons on the motion of Miss Ellen Wilkinson. The object of the Bill is to remove gross abuses of hire-purchase trading.

Mr. H. G. Williams, during the debate, said that they were all agreed with that object, but they must be very careful that they did not hit the legitimate trade. He was connected with the electricity supply industry, and he wished to explain very briefly some of the difficulties that might arise, and to express the hope that those difficulties would be satisfactorily met during the Committee stage. That industry had developed schemes of assisted wiring, which were a specialised form of hire-purchase. One could not very well remove wires which had been installed, sometimes embedded in the walls. This was a particular kind of hire-purchase in respect of which the Bill might require some small modification. Wires and switches embedded in or fixed to the walls were valueless if they were removed. Therefore, Clause 4 of the Bill (and there might be other clauses) would need to give protection in respect of assisted wiring, the social importance of which was very great. By means of assisted wiring schemes a very large number of people were able to get the benefit of electricity who otherwise would be denied it.

But these points did not challenge the principle of the Bill, and he hoped Miss Wilkinson would be successful in getting the Bill through Committee. So far as he could speak for the electrical industry, they would be glad to co-operate with her and consult her in advance in respect of amendments which they might desire to protect themselves.

Electricity Distribution

On Monday last the Minister of Transport, Mr. Leslie Burgin, received a deputation from the Association of British Chambers of Commerce. He was accompanied by Captain A. Hudson, Parliamentary Secretary to the Ministry, Mr. L. Browett, Permanent Secretary, Sir Cyril Hurcomb, deputy chairman of the Electricity Commissioners, Lord Erne and officials of the Ministry. The deputation was headed by Sir Geoffrey Clarke, C.S.I., O.B.E. (president), and the members included Mr. J. H. Maurice Clark (chairman of Special Committee), Lt.-Col. E. H. E. Woodward, M.C. (N.E. Electric Supply Co.), Dr. C. C. Garrard (Birmingham), Alderman Galliers (Brighton), Mr. Hurley (Leicester), and Mr. R. B. Dunwoody, C.B.E. (secretary). The deputation laid before the Minister its views on certain matters contained in the McGowan Report and the "White Paper" outlining the Government's proposals. The Minister promised to give consideration to the representations made to him.

In the Courts

Abyssinian Emperor's Claim

In the Chancery Division on December 10th Mr. Justice Bennett continued the hearing of the action in which Haile Selassie claimed an account of his dealings with Cable & Wireless, Ltd., under an agreement for a radio-telegraphic service between this country and Abyssinia. He further asked for payment of an amount due of about £10,000. The company admitted that the sum was owing, but contended that by virtue of a decree made by the King of Italy on May 9th, 1936, Haile Selassie's cause of action became vested in the Italian Government.

When the hearing was resumed Mr. Andrew Clark, for Haile Selassie, said the British Foreign Secretary had replied to the question submitted to him as to the status of his client and stating that the British Government still recognised him as *de jure* Emperor of Ethiopia.

After some discussion Mr Justice Bennett adjourned the further hearing of the action *sine die* for the purpose of asking the Foreign Office whether the British Government recognised the Italian Government as the *de facto* Government of Ethiopia or of virtually the whole of that country.

Winding-up Order

In the Companies Court on December 13th Mr. Justice Simonds had before him a petition for the winding-up of the Dulci Electrical Co., Ltd., Duke's Avenue, W., and 82, Cricklewood Lane, N.W., the petition being presented by Kingsway Electrical, Ltd. It was stated by Counsel that the petitioners were judgment creditors for £104 and were supported by creditors for £3,300.

His Lordship made the usual compulsory order

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Anglo-American Trade Negotiations

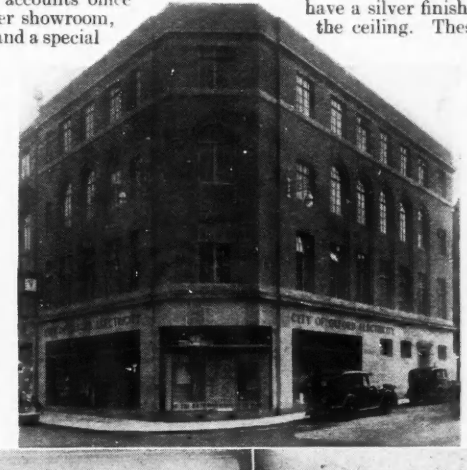
The Federation of British Industries has forwarded to the Prime Minister a statement setting out British industry's case in relation to the Anglo-American Trade negotiations. The Federation points out that it is more especially concerned with the effects on the future prospects of British trade of an agreement involving an undertaking either to scale down or to stabilise for a period the existing level of British tariffs at the present juncture, and draws attention to the necessity of avoiding any action which would undermine our present system of preferential inter-Imperial trade.

The South London Exhibition

The South London Exhibition which was cancelled last year following the fire at the Crystal Palace will be held there next year from March 16th to 26th. Five single-span pavilions constructed of canvas will house the exhibits, and the largest hall will be 420 ft. in length by 100 ft. wide. Two side halls will be 370 ft. long by 76 ft. wide, and two 144 ft. by 100 ft. The exhibition is being organised by Ewart Watson Exhibitions, Ltd.

New Electricity Showrooms at Oxford

The Oxford electricity undertaking was purchased by the City Council from the Oxford Electric Co., Ltd., in 1931, and until now the various sections of the Electricity Department have been scattered in different parts of the city. This handicap has been overcome by the erection of new showrooms and offices at the corner of George Street and New Inn Hall Street, Oxford, which were opened on December 1st. On the ground floor there is a large showroom and accounts office while on the first floor there is another showroom, a theatre for cooking demonstrations and a special room for water heating displays. The upper floors include offices for the manager and staff. The whole of the administrative staff of the Department, including mains, meters and head offices, are housed in the building. The heating of the premises, with the exception of the demonstration rooms, is by means of hot-water radiators supplied by a thermal storage electrode boiler plant. The showrooms have large display windows and for one of these the Hotpoint Electric Appliance Co., Ltd., has supplied a display background which forms the centrepiece of the window display installed by the company. A parody on a nursery rhyme, together with a few well-chosen words pointing out some of the advantages of the company's cookers makes an effective scheme. Since the Council took over the undertaking it has grown rapidly and the number of consumers has increased from 5,800 in 1932 to 14,100 to-day, the consumption rising during the same period from under 7,000,000 kWh to 30,000,000 kWh. This rapid development has been largely due to the introduction of a two-part tariff. There are 3,556 cookers and 3,109 water heaters in use.



The new showrooms of the Oxford City Electricity Department showing (top) the exterior, (left) the demonstration hall, and (right) one of the general showrooms

E.D.A. Publicity

The January Sales and Publicity Programme of the British Electrical Development Association draws attention to four new miniature coloured reproductions of recent E.D.A. posters which make attractive stamps for fixing to letters, accounts and envelopes. Particulars and prices are also given of publicity material available in connection with the "Better Light—Better Sight" campaign, and of the E.D.A. calendars for 1938. A new booklet on electric heating has been produced. This describes and illustrates the application of convectors, tubular heaters, panels, &c., and deals with their suitability for use in various rooms and positions. The Association has now produced the cooking poster in a 16-sheet size. The programme includes a price list of booklets and other literature available for distribution to the public.

Price Reductions

Graham Farish, Ltd., announce that they have reduced the price of their list No. 500 ½-kW fire.

Marconi-Ekco Instruments, Ltd., have sent us a list of downward revisions in the prices of their products, dating from December 15th.

Modern Office Lighting

Both decorative and efficient lighting is to be found at the new block of offices which the Equity and Law Life Assurance Society has just opened at 20, Lincoln's Inn Fields, London, W.C.2. Metal fittings resembling cartwheels with four spokes and concealing eleven 40-W lamps each give a novel touch to the main front offices. Similar units in the boardroom have a silver finish and the "spokes" are curved towards the ceiling. These, like the imposing octagonal bronze and frosted glass ceiling fittings in some of the principal offices and the entrance hall, have been specially made by John W. Mutlow. Round the ceiling of the actuarial department runs a large continuous circle of totally enclosed box fittings supplied by Harcourts, Ltd., who were also responsible for the corridor and general-purpose units. In the directors' luncheon room three pendants with fabric shades are supplemented by a square panel fitting let into the top of an alcove. Tricity and Bratt Colbran fires are employed where electric heating is preferred to the hot water radiators.

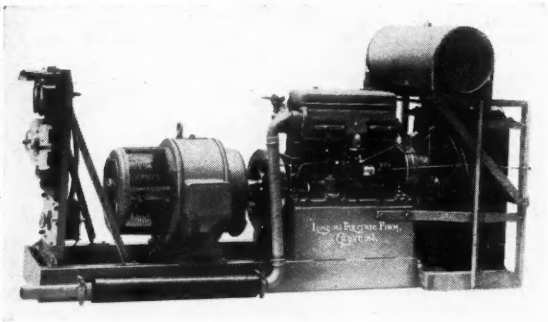
A specially designed Reliance automatic telephone system gives immediate communication with twenty selected points. Built into the loud-speaking instruments in the rooms of the heads of staff are buttons and indicators used in connection with the lights and buzzers fixed outside the doors for calling messengers and for the "engaged" signals. Should a messenger not reply immediately to a call made by the manager or chief actuary, a time-lagged switch actuates a buzzer in the clerks' room. A "Synchronome" clock system and J. & E. Hall lifts have been installed. Glover's cables and Wandsworth switches and switch-

plates are used throughout the building and a neat main switchboard has been built up out of M.E.M. units.

The fourth floor of the building is occupied by Ericsson Telephones, Ltd., who are particularly pleased with the light given by "Faraday-Megaphos" units supplied by Osler & Faraday, Ltd. Rows of totally enclosed box fittings on the two side walls give a very soft light in the boardroom. The latest type of the company's telephone system installed permits a single instrument to be used for both outside and inter-office calls, arrangements being made to "hold" the former if desired. Smith's clocks are installed. The electrical work for the whole building was carried out by Trollope & Colls, Ltd.

Searchlight Sets

The accompanying illustration shows one of a number of transportable high-intensity searchlight sets designed for the London Electric Firm, Croydon, and driven by a 35-h.p. Parsons petrol engine. The dynamo itself has the London Electric special feature of a drooping characteristic designed for search-



A 17 kW searchlight set driven by a Parsons engine

light work as in the case of military and anti-aircraft purposes. The dynamo is fan ventilated. The H4S Parsons engine delivers the required power at 1,500 r.p.m. and is of the four-cylinder type. The electrical output is 17 kW and, as will be noted, the whole plant is complete with instrument panels at the dynamo end, and a radiator and large fan at the other end. The fan is mounted direct on an extension of the crankshaft. It is not fixed rigidly to the shaft, but has a friction plate drive which avoids the nuisance and possible danger of fan blades breaking. The sets are intended to be mounted on lorries for transportation.

Arc Extinction

A working model in cardboard of a cross-jet explosion pot has been devised by Ferguson, Pailin, Ltd., for demonstrating some of the factors involved in rupturing-capacity tests. At the side is an oscillogram that shows the relationship of the current and voltage values to the position of the circuit-breaker contacts, as they are moved in the model, from the start of the short-circuit to the final interruption of the arc.

An Opportunity Seized

Last week the Wandsworth Technical Institute held its annual conversazione, and the County of London Electric Supply Co., Ltd., took the opportunity of staging an electrical display. One of the classrooms was used for this purpose, and as our picture shows an attractive display was arranged. As the students' parents attended the conversazione in considerable numbers, it was a happy inspiration to direct their attention to the apparatus and service available from their local supply company.

A Fish-frying Demonstration at Sheffield

The Sheffield Corporation Electricity Department, in conjunction with Mr. F. Whiteley, a Halifax range-maker, held a two-days' demonstration of electric fish frying at Fargate, Sheffield, last week, and over 500 friers were circularised to attend. The demonstrations had the full support of the Sheffield and District Fish Friers' Association, and officials assisted in welcoming the visitors in addition to Mr. Whiteley, and Mr. J. H. Campbell, assistant sales engineer of the Electricity Department. Visitors were invited to try their hands at electric frying in the range installed for the purpose, and results of their efforts were sampled by other guests. Following the frying sessions, Mr. Whiteley said that 90 per cent. efficiency was attained with the electric range as against 45 per cent. with gas. Electric ranges had been used by friers with success in Hull, Bradford, Halifax, and other towns. Greater efficiency also resulted through the heating elements being clamped to the pan bottoms, there was no waste heat, and no fume pipes were required, the fumes being taken away by a silent extractor system. Also the control methods were easily learned, and the heat was constant.

Australian Electrical News

Our Australian correspondent reports that attention has been drawn by members of the Electrical Manufacturers' Association of N.S.W. to the entry into the Commonwealth of oil circuit-breakers of Swiss origin, particularly those with a rupturing capacity of 250,000 kVA and over. Circuit-breakers of this rating are admitted at Customs rates of 15 per cent. (G.T.) and free (B.P.T.), and it is desired by Australian manufacturers that in such cases evidence of the goods having passed tests in accordance with British Engineering Standards should be submitted to the Customs Department.

An application for an industrial agreement made in 1936 between the Electrical Trades Union of Western Australia (Goldfields sub-branch) and a number of goldfields employers to be made a common rule was recently refused in the W.A. State Arbitration Court, objection being lodged by the Kalgoorlie Electric Lighting and Power Corporation, which suggested that it would be unfair if all employers in the districts concerned were bound by what only a few employers had consented to.

A number of recent accidents to persons using electrical equipment has resulted in a fall in sales of the cheap lines, much to the benefit of electrical dealers, who, as a rule, do not handle the type of merchandise which is sold by many of the chain stores. Unfortunately, many buyers of these cheap lines show little discrimination, price being the prime factor; but these accidents have pointed a moral which cannot be ignored.

A Consumers' Booklet

We have received from Mr. H. Breckell, engineer and manager of the Gainsborough U.D.C. Electricity Department, a copy of a booklet which is being circulated to all premises in the town with a view to receiving additional publicity. This informs prospective consumers how to obtain a supply of electricity and furnishes them and existing consumers with information on the general uses which can be made of the supply. Tariffs for the different types of electrical service are given and fully explained. Particulars of electrical appliances, together with all hire and hire-purchase schemes, are included.

A Large All-welded Factory

Ten years ago Murex Welding Processes, Ltd., was producing electrodes at the rate of about 300,000 ft. a week. Since then the demand for electrodes has increased so enormously that it has become necessary to erect a new factory capable of an initial output of 5,000,000 ft. a week and an ultimate output of double that amount. Covering an area of 4½ acres in a rectangular block 500 ft. by 375 ft. this new works will, it is claimed, be the largest all-welded steel-frame structure of its type in the country and will have the largest unsupported roof span ever erected. Production is expected to start early in the New Year, only some five months after the raising of the first girder. The welding throughout was carried out in the shops and on site by the electric arc process, using Murex welding plant and "Ironex" electrodes. Some idea of the speed of working by this method is given by the fact that the light secondary girders, of which there are forty-eight in the structure, were turned out at the rate of three per week by a gang of three welders and four erectors from cut lengths delivered on site. Three main girders each 500 ft. long and weighing approximately 70 tons run the entire length of the building and carry the ends of 125-ft. span lattice girders. The total weight of the steelwork used is 850 tons—

A display by the County of London Electric Supply Co. at Wandsworth Technical Institute

approximately 10 lb. of steel per sq. ft. of floor space. With only four internal columns the design provides for the maximum unobstructed floor space. Because of its strength, lightness, rigidity, speed of erection and economy of materials this all-welded type of construction is giving a new impetus to steel-frame building. Maintenance is much simpler than with

riveting, and since most of the welding is done on site there are few shop overheads. Apart from the factory, separate all-welded buildings are being erected as offices, canteens, and a laboratory block, which will include a research department, welding school and lecture theatre, test house and machine shops.

Unobtrusive Electrical Propaganda

There are a number of films the object of which is solely to propagate the electrical idea, and although these have already been seen by many people in various parts of the country, there must be thousands to whom such films are of little interest. It is interesting, therefore, to learn from Mr. J. D. Francis, acting manager of the Walton and Weybridge U.D.C. Electricity Department, that during the filming of "Lily of Laguna" at the studios of Archibald Nettlefolds Productions, Ltd., Walton-on-Thames, the Electricity Department was allowed the opportunity of making the kitchen all-electric; the cooker, refrigerator, water heater, kettle and cooker control unit being lent by the Department. An interesting point is that by the advance planning of the kitchen a recess was specially constructed to accommodate the refrigerator. As this film will be seen by many people who have not witnessed the electrical propaganda films, this method of drawing attention to the advantages of electrical kitchen equipment should serve a useful purpose. For the production of the film the company took the whole of its electricity supply from the Council.

A "still" from the film "Lily of Laguna"

I.F.S. Electrical Imports

Imports of electrical goods and apparatus into the Irish Free State during the ten months January-October of this year at £989,633 are up by £80,000 compared with the corresponding period in 1936, notwithstanding a sharp fall in the imports of electric lamps following the imposition of prohibitive tariffs to encourage home manufacture. Telegraph and telephone apparatus increased in value by over £57,000 as a result of the reorganisation and improvement of the country's communication systems at present being carried out by the Department of Posts and Telegraphs. The next biggest increase occurred in the case of "other electrical goods and apparatus"—from £252,727 in 1936 to £284,002 this year.

	Ten Months. January–October. 1936.	1937.
Electrical machinery :		
Motors	£45,003	£48,557
Other sorts	184,268	188,006
Dry batteries, complete	13,265	14,391
Dry batteries, parts of	3,446	3,956
Electric lamp bulbs	43,861	19,514
Electric lighting accessories, fittings and parts	66,233	66,311
Telegraph and telephone apparatus	32,105	89,556
Electric wires and cables	86,475	74,624
Radio-telegraph apparatus :		
Broadcast receivers, fully manufactured	82,314	92,184
Radio-gramophones, fully manufactured	2,280	2,263
Other sorts, fully or substantially assembled	7,681	10,777
Component parts and accessories	89,946	95,392
Other electrical goods and apparatus	252,727	284,002
Total	£909,604	£989,533

Trade Announcements

Beethoven Radio, Ltd., has changed its name to Beethoven Electric Equipment, Ltd. The policy and management of the company will remain as hitherto, but, in addition to the manufacture of radio receivers, the company will also manufacture all types of domestic electrical appliances and internal telephone equipment. The company has amalgamated with Wilkes, Berger Engineering Co., Ltd., and Messrs. S. Montague and D. Montague, joint managing directors of the Beethoven Electric Equipment, Ltd., have also been appointed to the board of the Wilkes, Berger Co. Messrs. F. W. Wilkes and M. M. Berger have joined the board of the Beethoven company.

The Quadrant Carbon & Metal Products, Ltd., Cumberland Road, Stanmore, Middlesex, has entered into an arrangement with the Littelfuse Co. of Chicago, Ill., manufacturers of miniature fuses of all kinds, whereby the Quadrant company will manufacture in England the American concern's products.

John Newbury, Ltd., have opened a new radio and electrical showroom at 27, Broadway Parade, Crouch End, N.8.

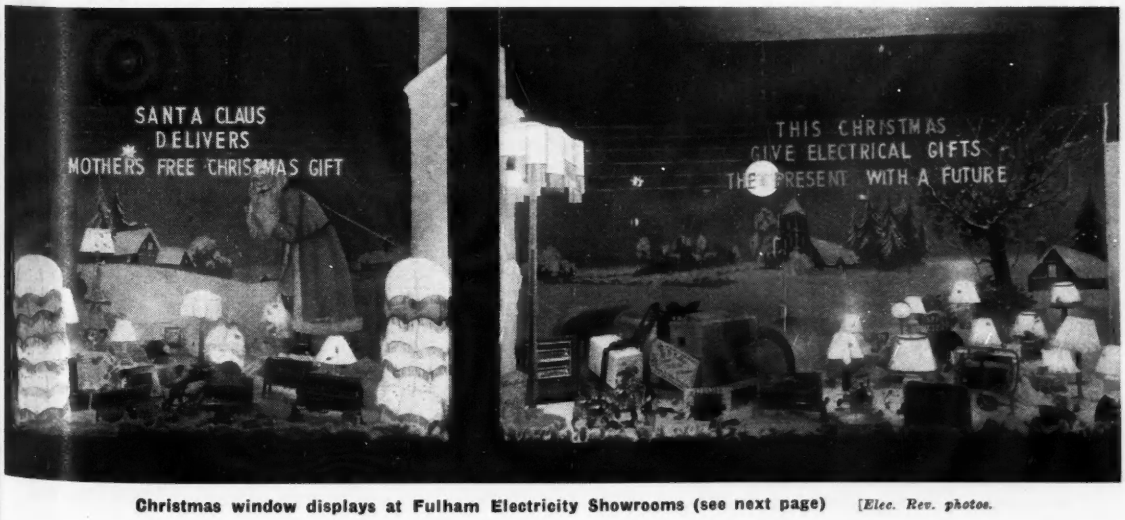
Batti-Wallahs' Society

Lord Alness, P.C., a member of the Judicial Committee of the Privy Council and a former Secretary for Scotland and Lord Justice-Clerk, was the principal guest at the luncheon of the Batti-Wallahs' Society held at the Hotel Victoria, W.C.2, on Friday last. In the course of an interesting address he related a number of experiences and some notable remarks by other eminent judges. A vote of thanks was moved by Sir Montague Hughman, a past president. Col. Sir T. F. Purves, O.B.E., presided, and among those present was Mr. L. M. Waterhouse, first president of the Society.

Social Events

The sixteenth annual dinner of the "Old N'Ions" (the Northampton Engineering College Past Students' Association), was held at the Café Royal, Regent Street, on December 10th, Mr. H. W. Grimmitt (president), being in the chair. Mr. E. T. Painton proposed the toast of the "N'Ions," mentioning that many members filled important positions throughout the world. The president, in responding, considered that the College should be known more widely for its excellent work and results. An indication that it was appreciated in the engineering industry was that Babcock & Wilcox had recently endowed a scholarship. Mr. Grimmitt paid a tribute to the work of the hon. secretary of the Association, Mr. R. P. Hilton. Mr. Rennie, one of the founders of the Association, proposed the toast of the "Absent Old N'Ions."

A dinner followed by a visit to the Holborn Empire, was the method adopted by Baxter & Caunter, Ltd., of wishing members of their staff and guests a "Merry Christmas and a Prosperous New Year." The dinner, which is an annual event,



Christmas window displays at Fulham Electricity Showrooms **(see next page)** *[Elec. Rev. photos.*

was held at Pritchard's Restaurant, Oxford Street, on December 8th, and about a hundred sat down to excellent Christmas fare. Mr. G. W. Kettlewell (director), in a few well-chosen words, wished all present prosperity and happiness during 1938.

On December 10th the Ipswich and District Electrical Association held its third festival dance at St. Matthew's Baths Hall. The ballroom was brilliantly lighted by festoon, flood and top lights. Among those present were Mr. S. G. Roper, the Association's chairman, Mr. A. E. Knights, borough electrical engineer, Bury St. Edmunds, and many well-known engineers from manufacturing firms with branches in the town, electrical contractors and factors.

Over 200 members of the Callender Athletic and Social Club (London Section) were present at a dinner, dance and whist drive held at Bush House Restaurant on December 10th. Mr. Howard Foulds presided, supported by his daughter, Miss Muriel Foulds, who later presented the whist prizes. After dinner the health of Sir T. O. Callender was drunk with enthusiasm, and a telegram of greetings was despatched to him. A feature of the evening was the cabaret provided by Somerfield Orchestras, Bennett and Williams, and Dorvay and Dorett.

Registered Electrical Contractors

At the last meeting of the Executive Committee of the National Register of Electrical Installation Contractors the following applications for registration were accepted :—

C. E. Burgess, Ardwick, Manchester, 12.
Elite Radio Co., Clitheroe, Lancs.
J. H. Corfield, Blackfords, Cannock.
Carver & Lee, Keighley.
A. E. Plumbe & Co., Ltd., Maghull, aLncs.
Grays Electrical Co., Ltd., Grays, Essex.
J. Reilly, Hexham, Northumberland.
A. Baird & Sons, Annan.
Thos. Blackburn & Sons, Ltd. (trading as Stevensons), Preston.

At the same meeting five applications were declined.

Orders Recently Booked

The London and North Eastern Railway Co. announces that, in connection with the Manchester-Sheffield-Wath electrification scheme, a contract has been placed with the Metropolitan-Vickers Electrical Co., Ltd., for the design, manufacture and erection of seventy complete electrical equipments required for mixed traffic electric locomotives, and suitable for the overhead line conductor system, using d.c. at 1,500 V, which is the higher voltage standard system authorised by the Ministry of Transport. These mixed traffic locomotives will be of the four-axle, double-bogie type, and it is estimated that the weight will be 80 tons each, and that the horse power will be approximately 1,850. The mechanical portion of the locomotives, comprising the underframe, superstructure and motor bogies, will be built at the railway company's works. The line between Manchester, Sheffield and Wath has heavy gradients, in one case as steep as 1 in 40 for rather more than two miles, and the traffic on this section of line is particularly dense, varying in character from express passenger trains of 250 tons to heavy mineral trains of 1,100 tons in weight. It is intended that these mixed traffic locomotives shall be used for all classes of traffic, except the express passenger trains, for which a small number of electric locomotives of the express type will be required.

For the rewiring of No. 10, Downing Street, the Prime Minister's residence, Henley Burrowes & Co. supplied a considerable quantity of their double-pole automatic interlocked switch-plugs.

F. W. Brackett & Co., Ltd., Colchester, have been awarded the contract for the manufacture and installation of condenser water screening equipment and auxiliaries for the Littlebrook power station, Kent, to the order of the Kent Electric Power Co., Ltd., on the recommendation of Merz and McLellan, consulting engineers.

Electricity in Schools

The British Electrical Development Association is taking a prominent part in the *News Chronicle* Schools Exhibition which opens next Monday at Dorland Hall, Regent Street, S.W.1, On the Association's stand visitors will find photographic records and information concerning modern methods of lighting and heating of school classrooms, halls, corridors, gymnasia, &c. The use of electric cooking refrigeration, laundry and handicraft equipment for domestic and housewifery centres will also be demonstrated. Several sections of the exhibition, including a model flat and the architectural section, are being lighted by G.V.D. Illuminators, Ltd., who are also responsible for the whole of the lighting at the display arranged at Charing Cross Underground Station in connection with the exhibition.

Modern Lighting Fittings

"Lighting of To-day" is the title of a well-produced catalogue of lighting fittings, issued by Berry's Electric, Ltd., which contains in its 66 pages brief particulars, illustrations (some in colour), and prices of a wide range of modern lighting fittings. The catalogue has been produced, except for the colour pages, entirely by the company's own printing department.

Firth-Brown Centenary

In 1837 Sir John Brown commenced business on his own account and in 1864 John Brown & Co. was registered as a limited liability company. The firm of Thos. Firth & Sons was founded by Thomas Firth and his two sons in 1842, and the concern became a limited company in 1881. These companies, in the course of years, became two of the most important steel manufacturing concerns, and in 1930 Thos. Firth & Sons, Ltd., and the steel producing interests of John Brown & Co., Ltd., amalgamated to form Thos. Firth and John Brown, Ltd., under the chairmanship of Lord Aberconway. This company has issued a handsomely produced volume containing an account of the history and progress of the two concerns from their earliest beginnings until the celebration of the centenary, 1937. The numerous illustrations (in colour) include views of the company's works and some of its products, and an atlas indicates its world-wide representation.

Electrical Inventions

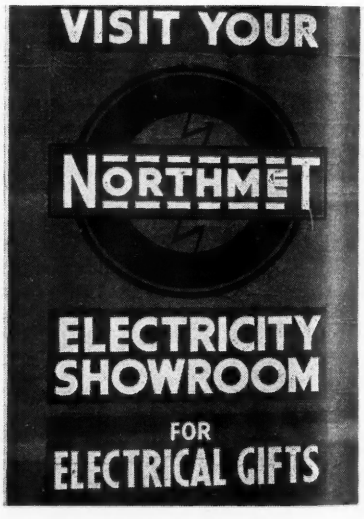
Among the apparatus shown at the New Inventions Exhibition at Sheffield and Leeds were several having an electrical bearing—some of practical interest, others not. The exhibits included a carbon transverse-current microphone designed to eliminate "rustle" and working at 3 V with 5-W amplification; average speaking distance is from 2 to 4 ft., but certain noises, it is claimed, can be heard half a mile away. A device by means of which a lamp and its shade are fixed in place by slight pressure and a turn should be useful; so also should a conduit bender, which is said not to damage threads or to open seams. Other products of ingenuity are an appliance for jointing small stranded cables, a face bulb for miners' lamps, a punctured-tyre indicator and a device for automatically illuminating the dial of an alarm clock when the latter goes off.

A demonstration was given of the Blacktin "Electrictor" dust and smoke meter, which is claimed to achieve economy of operation and working parts through the operation of four synchronous principles due to the same movement, viz., electrification, rotation, suction and centrifuging; electrification of a record disc promotes the retention of the particles under analysis; as there are several ingresses for the entry of the dispersion to be analysed, in addition to the rotating record disc, a wide choice of deposition areas and particle spacing is offered. Particles of smoke or dust can, it is said, be counted up to 1,500,000 per cu. cm. The instrument is about 12 in. long and weighs just over 1 lb.

Selling Electrical Gifts for Christmas

No period in the year provides such an opportunity to electricity supply undertakings as Christmas for selling domestic appliances. During the past few days we have been visiting some of the showrooms in London to see what is being done to encourage the purchase of electrical gifts. On pages 849 and 865 we reproduce several photographs showing some of the means adopted.

Getting a prospective customer inside a showroom is half the battle. That is why attractive seasonal window displays are so important. Snow scenes, including figures of Santa Claus, Christmas trees, etc., give plenty of opportunities to show originality and the showroom managers have been quick to take advantage of them. Somewhat different from the rest, a very apt display at Battersea shows the Magi amid a selection of electrical apparatus. A seascape with the wording "It's plain sailing with a Jackson electric cooker" is another novel idea at the same showrooms. Christmas carols reproduced on a radio-gramophone help to attract attention at Fulham, where the whole display is designed to "tie up" with the Electricity Department's scheme for supplying various apparatus free of charge under a ½d. per "unit" all-in prepayment meter charge.



A special Christmas poster used by the Northmet Company
[*Elec. Rev. photo.*

Inside the showrooms, too, the arrangement of various articles on Christmas trees and display stands in the form of iced cakes, etc., helps to create an appropriate atmosphere. Special demonstrations of Christmas cooking have been arranged in most cases, and the culmination of a series of seven demonstrations at Chiswick will occur on Tuesday, when the Mayor of Brentford and Chiswick, Alderman Leahy, will present free gifts of fires and irons to holders of lucky tickets. Several of the undertakings are sending out special literature to consumers suggesting suitable electrical presents, and accompanying these notes is a picture of a Northmet poster.

Calendars and Diaries

"Rolling Down to Rio" is the title of the picture selected by F. W. Brackett & Co., Ltd., for their calendar. This shows a three-masted ship in full sail.

The 1938 calendar received from the Chloride Electrical Storage Co., Ltd., has monthly sheets, each bearing a well-executed study in colour with an inscription appropriate to the company's "Exide" and "Drydex" batteries. The "Exide" diary is neatly bound in leatherette of a pleasing grey shade and in addition to the usual general information includes particulars of the company's batteries, pocket and handlamps, torches, &c.

We have again received from British Insulated Cables, Ltd., a wall calendar showing the current, preceding and following months, below which are calendars for 1937, 1938 and 1939.

An Up-to-date Printing Works

Referring to the article in our last week's issue (page 821) describing the new printing works for *The Times*, the Morse Chain Co., Ltd., informs us that forty of its chain drives were employed to transmit power from the main motors to the presses. W. T. Henley's Telegraph Works Co., Ltd., inform us that all the v.i.r. wires and cables (totalling over 25 miles) were supplied by them.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. December 15th.	Fortnight's Inc. or dec.
a Acid Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal)... „	£18 10s.	—
a Borax ... ... „	£17	—
a Copper, Sulphate ... ... „	£22 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a „ Perchlorate ... ... „	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a „ Roll ... ... „	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a „ Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. net.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b „ Wire ... ... per lb.	1/1 to 1/9	—
b „ Sheet and Foil... ... ... „	1/3 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£187	£11 inc.
Grade II ... ... „	£131	£6 inc.
Grade III... ... ... „	£75	£3 inc.
c Brass (rolled metal 2" to 12" basis)... per lb.	8¼d.	—
c „ Tubes (solid drawn) ... ... „	11¼d. to 11¼d.	—
c „ Wire, basis ... ... „	8¾d.	½d. dec.
c Copper Tubes (solid drawn) ... „	1/0½	½d. dec.
g „ Bars (best selected) ... per ton	£76	—
g „ Sheet... ... ... „		
g „ Rod ... ... „		
d „ (Electrolytic) Bars ... ... „	£45	—
d „ „ Wire Rods ... „	£50 10s.	—
d „ „ H.C. Wire ... per lb.	8½d.	—
f Ebonite Rod ½" dia. & up ... ... „	1/10 to 2/5	—
f „ Sheet ⅛" thick & up ... „	1/5 to 1/10	—
n German Silver Wire, Nos. 1 to 12 ... „	2/4	—
h Gutta-percha, fine ... ... „	nom.	—
h India-rubber, Para-fine ... ... „	7¼d.	—
i Iron, Pig (Cleveland, No. 3) ... per ton	£4 5s.	—
i „ Wire galv. No. 1 P.O. Qual.... „	£23	—
g Lead, English Pig ... ... „	£17 5s.	15s. dec.
g Mercury ... ... per bot.	£13	—
e Mica (in original cases) small ... per lb.	10d. to 2/–	—
e „ „ „ medium ... „	6/– to 12/6	—
e „ „ „ large ... „	13/– to 17/6 up	—
p Phosphor Bronze, plain castings ... „	1/2½	½d. dec.
p „ „ drawn bars & rods „	1/1½	½d. inc.
p „ „ rolled strip & sheet „	11d.	½d. inc.
p „ „ wire ... ... „	1/0½	½d. inc.
o Platinum ... ... per oz.	£7 12s. 6d.	12s. 6d. dec.
d Silicium Bronze Wire ... ... per lb.	8½d.	—
g Spelter ... ... per ton	£14 16s. 3d.	11s. 3d. dec.
g Tin, Block (English) ... ... per ton	£190 10s.	£5 10s. inc.
n „ Wire, Nos. 1 to 16 ... ... per lb.	4/3	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Holiday Arrangements

The works of Bruce Peebles & Co., Ltd., will close on December 31st and reopen on January 6th. No goods will be received or dispatched during the holiday period. The head office (in Edinburgh) will be closed on Christmas Day.

New Catalogues and Lists

Ideal Boilers & Radiators, Ltd., Hull.—Leaflets illustrating "Ideal" electric hot-water radiators.

British Insulated Cables, Ltd., Prescot.—A catalogue of the B. I. Macintosh (under the eaves) distribution system.

J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.—Details of new shielded sockets.

Linolite, Ltd., 96, Victoria Street, London, S.W.1.—A handbook giving practical and theoretical information regarding the technique of the line source, including polar distribution curves, of "Linolite" reflectors.

Claude-General Neon Lights, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2.—"Fact Reflections," a booklet illustrating and describing the manufacturing of neon tubing.

Atlanta Appliances, Ltd. (late Batwin Appliances), 138, Southwark Street, London, S.E.1.—Details of the "Batwin" electric fan heater.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, London, W.1.—Leaflets dealing with a new coffee percolator and make-up mirror.

Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, London, E.C.1.—A complete (41-page) catalogue of electric bells and telephones.

Wright Electric Motors (Halifax), Ltd., Century Works, Pellon Lane, Halifax.—Details of electric suds pumps.

Gent & Co., Ltd., Faraday Works, Leicester.—Catalogues dealing with electric process timing apparatus and telephones for office and industrial use.

Goodliffe Electric Supplies, Ltd., 8, Eagle Street, London, W.C.1.—A catalogue of "Theban" time switches and relays.

English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2.—A technical booklet on modern oil circuit-breaker design employing the de-ionising method of arc control; an abridged price list of motors and control gear; and a catalogue of motors for driving machinery at docks and wharves.

Company Liquidations

Gaskell and Garraway, Ltd., 15, Hammet Street, Taunton, electrical and radio engineers.—The statutory meeting of creditors was held recently at Taunton, when Mr. J. M. Gaskell, a director of the company, presided. A statement of affairs as at November 27th last was submitted which disclosed liabilities of £12,152, of which £3.706 was due to the trade, the bank were creditors for £6,746, and there was a loan creditor for £1.700. The net assets were £6,809, leaving a deficiency of £5,343. The creditors passed a resolution confirming the voluntary liquidation of the company with Mr. H. J. Pollard, accountant, Taunton, as liquidator, with a committee of inspection consisting of the representatives of Brunwec, Ltd., Metal Agencies Co., Ltd., and T. S. Penny, Ltd. The following are the principal creditors:—Brunwec, Ltd., £207; Callender's Cable & Construction Co., Ltd., £243; Kelvinator, Ltd., £614; Metal Agencies Co., Ltd., £359; T. S. Penny, £Ltd., £159; and Sun Electrical Co., Ltd., £790.

Harrow Electric Light & Power Co., Ltd.—Winding up voluntarily. Liquidator, Sir James Devonshire, Wall House, 1, The Green, Wimbledon Common, S.W.19.

Radio Utilities, Ltd.—Meetings January 10th at 35, Windsor Place, Cardiff, to receive an account of the winding-up by the liquidator, Mr. L. S. Findlay.

River Plate Electricity Co., Ltd.—Meeting January 10th at 62, New Broad Street, E.C.2, to receive an account of the winding-up by the liquidator, Mr. F. J. Moss.

Bankruptcy Proceedings

J. N. Waring, electrical engineer, Grangecliffe Gardens, Sydenham, and late of 9, Sandland Road, Bedford Row, W.C.—A sitting of the London Bankruptcy Court was appointed to be held on December 7th before Mr. Registrar Parton for the public examination of this debtor, against whom a receiving order was made in August last on the petition of creditors. Debtor began business ten years ago and attributed his failure to the collapse of various companies in which he was interested. The Official Receiver reported that the debtor had been a sufferer from tuberculosis and had been an inmate in various hospitals. It had been found impossible to secure his attendance and he applied for the sitting to be adjourned sine die. His Honour made an order to that effect.

E. B. Clendinnen, 111, Wolverhampton Road, Stafford, Staffs, radio dealer.—At the public examination herein held recently at Stafford the statement of affairs disclosed a deficiency amounting to £590. Concerning the causes of his failure debtor stated that under the present system of selling sets on hire-purchase terms he stood to make considerable losses. The examination was closed.

W. J. Fishbourne, electrical and mechanical engineer, 7, Tynewydd Terrace, Newbridge, Mon.—Receiving order made December 2nd on debtor's own petition.

C. R. H. Douse (Clifford Radio), 118, Sneinton Dale, Nottingham.—Public examination January 6th at the County Court House, Nottingham.

B. H. Auld, electrical engineer, 38, Sheen Common Drive, Richmond, Surrey, lately trading as B. H. Auld & Co. at 66, Victoria Street, S.W.1.—Discharged as from November 10th, 1937.

G. E. Hewett, radio dealer and electrical engineer, 107, Kenton Road, Harrow.—Discharged as from November 25th, 1937.

L. J. Powell, radio engineer, 209, High Town Road, Luton.—Trustee, Mr. T. Bengough, 6, The Parade, Northampton, Official Receiver, released November 25th.

H. G. Hayward (Modern Electric Service), electrical engineer and radio dealer, 42, Wilton Avenue, Southampton, Official Receiver, released November 25th.

L. G. Bailey (L. G. Bailey & Co.), radio dealer, 1, Port Soderick Street, Salford.—Trustee, Mr. W. H. Chesworth, 1, Cooper Street, Manchester, released November 30th.

P. T. Bradley, radio engineer, 1, The Arcade, Stafford.—Trustee, Mr. R. E. Clark, 17, Albion Street, Hanley, Stoke-on-Trent, released November 18th.

C. H. F. Thick, electrical engineer, 1, Nuns Walk, Winchester, lately trading at that address in partnership. Trustee, Mr. A. L. Medcalf, 10, Rockstone Place, Southampton, Official Receiver, released December 1st.

R. Terrell.—With reference to the receiving order made in this case (ELEC. REV., December 10th, p. 830), we are asked by the Terrell Industrial Corporation, Ltd., of Aldwych House, London, W.C.2, to state that Mr. R. Terrell is not now a director of the company.

Electricity Supply

Lighting, Domestic, Power

Ascot.—PUBLIC SUPPLY.—The L.C.C. Hospitals Committee reports that as the boilers and engines for generating electricity at the Heatherwood Hospital, Ascot, show signs of deterioration it is proposed to obtain the electricity required from the local supply company. This necessitates certain rearrangements and modifications estimated to cost £1,250. It is computed that the alteration will result in a saving of £43 a year.

Birkenshaw.—SUB-STATION.—The Electrical Distribution of Yorkshire, Ltd., is to erect a sub-station in Birkenshaw Lane.

Bradford.—GRID SUPPLY VOLTAGE.—Approval has been given by the Electricity Committee to arrangements with the Central Electricity Board in respect of the change of voltage of the connection between the Board's system and that of the Corporation at the Valley Road power station from 6.6 kV to 33 kV at an estimated cost of £24,000.

Brighton.—ELECTRIC HEATING.—The Health Committee is to install electric heating at the sanatorium at a cost of £941, and at the Whitehawk health centre (£350).

CABLE LAYING.—The Electricity Committee is to lay a cable from Hove Street to the Kemp Town section, at a cost of £18,044.

Broadstairs.—ELECTRIC LIGHTING.—Seventeen electric lamps are to be placed in High Street, Broadstairs, and the existing gas lamps removed in 1940, when the Council's agreement with the Broadstairs Gas Co. expires. North Foreland Road is also to be lighted by electricity.

Burntisland (Fifeshire).—NOT ALLOWED TO INSTALL ELECTRICITY.—At its recent meeting the Council refused to grant permission to the tenant of one of its houses to install electric lighting. Opposition was on the ground that the granting of such an application would affect the revenue from gas.

Chatham.—LOWER CHARGES.—It was reported to the Council last week that when representatives of Chatham and Rochester Councils and the Kent Electric Power Co. met recently it was disclosed that the company was prepared to introduce the following reductions in the charges now operating under the agreement of April 9th, 1935, between the two local authorities and the company: Lighting flat rate to be reduced from 5½d. to 5d. per kWh in the case of domestic and business premises; the two-part tariff running charge for domestic and business premises to be ⅝d. instead of ¾d.; the standing charge of the business two-part tariff to be reduced from 6s. 3d. to 5s. 6d. per quarter per 100 W of installed lighting; and a special flat rate of ½d. per kWh to be made available for water heating (heaters will be hired out by the company and consumption registered by special meter, but no meter rent will be charged for this service). The reductions will come into force on January 1st next.

East Ham.—SUB-STATIONS.—Schemes for the erection of sub-stations at Altmore School and Caulfield Road, involving an expenditure of £9,763, have been approved by the Council.

Glendale (Northumberland).—ELECTRICITY OR GAS?—The Rural District Council is considering whether gas or electricity should be installed in eighteen new houses at Wooler. The Ministry of Health considers that it is unnecessary to provide both services.

Gosforth (Northumberland).—ELECTRICAL INSTALLATIONS.—The Urban District Council proposes to borrow £1,250 for electrical installations in 168 houses at Coxlodge.

Halesowen.—SUB-STATION.—The S.W. and S. Electric Power Co. is to erect a sub-station at Carter's Lane.

Hastings.—MAINS AND SUB-STATION.—The Electricity Committee is to extend mains and provide a sub-station in Harley Shute Road at a cost of £1,138. A sum of £5,100 is to be spent on extending cables to Silverhill.

Hednesford.—CHRISTMAS ILLUMINATIONS.—After the Coronation the Cannock Urban District Council decided that there should be a display of illuminations in some part of the urban district each autumn or Christmas, and the scheme of decorative lighting at Hednesford referred to in our issue of December 3rd is the first of the series. It is being carried out by the Cannock Electricity Department (chief engineer and general manager, Mr. P. Wardle) for the Chamber of Commerce in connection with the Christmas Shopping Week.

Hunstanton.—CHEAPER STREET LIGHTING.—The East Anglian Electric Supply Co., Ltd., has offered cheaper rates for the lighting of the Promenade.

Inverness.—CALEDONIAN POWER BILL.—The Town Council has agreed that the Town Clerk shall communicate with the Convention of Royal Burghs, pointing out the hardship involved in the town of Inverness having again to oppose the Caledonian Power Bill, which has already been twice defeated in Parliament. Burghs like Inverness, it is claimed, should not be called upon year after year to meet expenses in connection with opposing Provisional Orders of this kind. The Council suggests that the Convention should press for an amendment to the Private Legislation Procedure (Scotland) Act to prevent Provisional Orders in similar terms being again presented before the lapse of a period of years. A motion that the County Council should be advised strongly to oppose the Bill was defeated at a meeting of Inverness District Council. It was agreed that the matter should be left to the County Council's Parliamentary and Law Committee to deal with.

London.—CAMBERWELL.—The scheme to provide efficient electric lighting in the 145 miles of main, secondary and residential thoroughfares in the borough has now been practically completed by the County of London Electric Supply Co., Ltd., but owing to existing contracts not yet having expired a few of the main thoroughfares will not be relighted until 1939. Most of the secondary and residential roads are illuminated by 150-, 200- and 300-W "Osram" lamps housed in G.E.C. open-type "Wembley" lanterns. The recent change-over in the Old Kent Road and Peckham High Street aroused considerable local interest, 400-W "Osira" high-pressure mercury electric-discharge lamps in G.E.C. "Difractor" lanterns being installed. Approximately 150 units are required for lighting this section of the main traffic routes of the borough, which covers some four and a half miles and extends along such important thoroughfares as Camberwell New Road, Camberwell Green, Camberwell Road, part of Denmark Hill and Church Street, as well as those already mentioned.

Lowestoft.—LIGHTING RECOMMENDATION NARROWLY DEFEATED.—A proposal for all-night lighting in certain streets of the town has been referred back by a majority of one vote.

Malvern.—REDUCED ELECTRICITY CHARGES.—The following reduced electricity charges have been approved by the Council to take effect from the December quarter meter readings:—Lighting, 5d. per kWh for the first 500 kWh a quarter, and 4¾d., 4½d., and 4¼d. per kWh for each subsequent 500 kWh, with supplies over 2,000 kWh a quarter at 4d. per kWh, subject to 7½ per cent. discount for payment within fourteen days. Prepayment consumers, 5d. per kWh net.

Nelson.—METER TESTING.—An application for sanction to borrow £811 for a meter-testing station has been authorised by the Electricity Committee.

Nottingham.—CHEAPER ELECTRICITY.—The City Council recently approved reductions in the price of electricity, as follows: Lighting, flat rate, 4d. (in place of 4½d.), maximum demand system 6d. and 2d. (in place of 7d. and 2d.); public lighting tariff, 1d. per kWh for first 1,000,000 kWh per annum and thereafter ¾d. per kWh (against 1d.).

Penmaenmawr.—CHEAPER POWER.—A reduction in the price of electricity for power has been approved by the Urban District Council. Instead of being 3d. per kWh up to 500 kWh and 2d. per kWh for all supplies in excess of this quantity the rates from January 1st will be 2d. and 1½d., respectively.

Peterborough.—METER-TESTING APPARATUS.—Tenders are to be invited for new electricity meter-testing apparatus which is required in connection with the Electricity Act, 1936, at a cost of approximately £708.

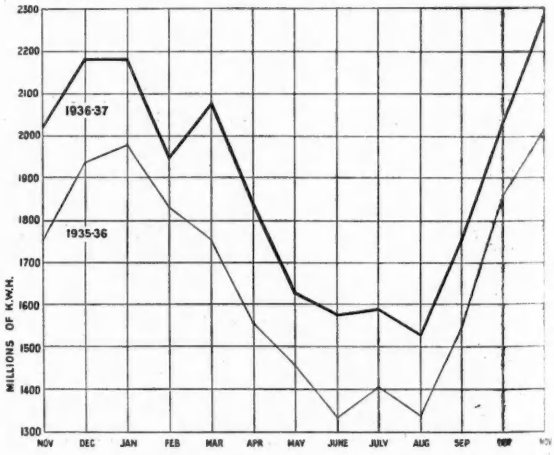
LOAN.—Permission has been granted to the borrowing of £11,555 for high-voltage mains and additional sub-stations.

Scarborough.—DEVELOPMENTS.—The Town Council has received sanction to borrow £1,279 for converting premises in Seamer Road into a stores department for the electricity undertaking and £719 for a sub-station in Aberdeen Place. Applica-

Generation of Electricity in November

THE official returns rendered to the Electricity Commissioners show that 2,285 million kWh was generated by authorised electricity undertakings in Great Britain during November, as compared with the revised figure of 2,010 million kWh in the corresponding month of 1936, representing an increase of 275 million kWh, or 13.7 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was twenty-six, against twenty-five in November, 1936.

During the eleven months of 1937 up to the end of November the total quantity of electricity generated by authorised undertakings was 20,405 million kWh, as compared with the revised figure of 18,041 million kWh for the corresponding period of 1936, representing an increase of 2,364 million kWh, or 13.1 per cent.



Comparative output curves

tion is to be made for permission to borrow £20,000 for apparatus and £796 for the proposed extension of the 11,000-V distribution system to Sawdon.

Stoke-on-Trent.—PRICE REDUCTIONS.—The North-West Midlands Joint Electricity Authority has announced the following reduced charges for electricity supplies from and including the March quarter, 1938:— Lighting, separately metered, 5½d. per kWh; meter rent, 1s. per quarter; "unit" charges under the alternative tariff, domestic premises, ¼d. per kWh, and farm buildings, ¾d. per kWh.

Sunderland.—ILLUMINATIONS PROFIT.—The electrical illuminations held in Roker Park by the Town Council last August have resulted in a profit of £748, according to a report submitted to the Council.

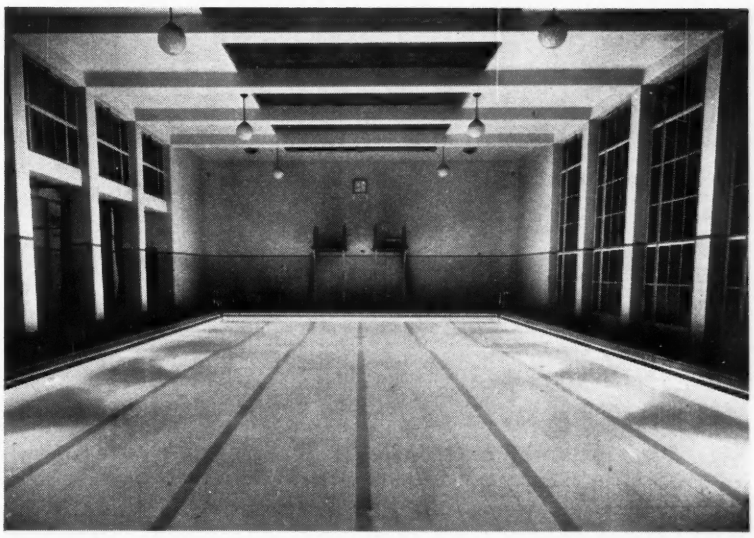
Wakefield.—WASH BOILERS.—The Housing Committee is to provide modern electric wash boilers in thirty-eight houses on the Portobello estate at a total cost of £266.

LOANS.—Sanction has been obtained by the Electricity Committee to borrow £5,000 for meters and £9,515 for apparatus.

Walsall.—METERS.—The certification of meters under the Electricity Supply (Meters) Act, 1936, was commenced on December 14th at the testing station of the Electricity Department. Mr. E. A. Newburn, the engineer and manager, reports that some 200 meters were duly certified and no difficulty was experienced in complying with the Electricity Commissioners' Regulations.

Wallsend.—CABLES.—The North-Eastern Electric Supply Co., Ltd., is to lay low-voltage underground cables in Boyd Road and in new streets on the East Farm estate.

Watton.—EXTENSION OF LIGHTING.—The East Anglian Electric Supply Co., Ltd., will shortly erect an extension to the overhead lines along the Dereham Road at Neaton, and the Council is to install a number of street lamps along the route.



This photograph of the new swimming baths at the City of London School, Victoria Embankment, E.C.4, was taken by means of the under-water lighting provided by fourteen 250-W G.E.C. special watertight fittings. The installation was carried out by Grierson, Ltd.
[Elec. Rev. photo.

West Hartlepool.—WEEKLY TARIFF.—The borough electrical engineer has reported that a large number of consumers have applied for inclusion in the weekly tariff system.

Wimbledon.—BATTERY CHARGING TARIFF.—A flat rate of ¾d. per kWh for charging the batteries of electrically driven vehicles has recently been fixed by the Electricity Committee.

Wolverhampton.—AERODROME SUPPLY.—The Electricity Committee is to provide a supply to the Cosford aerodrome at a cost of £1,240.

Traction

Brighton.—MERGER SCHEME.—A meeting of ratepayers on Tuesday approved (by 275 votes to 81) the promotion of a Bill to provide for the pooling of the Corporation's transport services with those of the Brighton, Hove and District Omnibus Co., Ltd. The scheme involves the substitution of trolley-buses for the trams within three years.

France.—NEW LOCOMOTIVE.—In a recent issue of *Le Genie Civil* a description is given of the 4,400-h.p. Diesel-electric locomotive which has recently been constructed by the Compagnie des Forges et Acieries de la Marine et d'Homecourt for the Paris-Marseilles-Nice-Mentone service. It is designed to attain a speed of 81 m.p.h. over a large part of the distance of 694 miles when hauling a train weighing 450 tons. Although permanently built up together, the machine practically forms two locomotives, each with three driving axles with 4 ft. 11½ in. diameter wheels and two four-wheel bogies, each half being provided with a Sulzer-Diesel four-stroke engine comprising two sets of six side-by-side cylinders. The generators are of Jeumont construction and the net weight of each dynamo is about 20 metric tons. Each of the six driving axles is provided with a traction motor suspended in the chassis and driving the axle through special gearing, each set of three motors being coupled in parallel. The electrical circuits are so arranged that in case of breakdown of either of the two generating sets its corresponding three motors may be supplied with power in series with the other three by the power unit still operating. The locomotive weighs in running order, with 7 tons of fuel, about 225 metric tons, equal to about 112½ lb. per h.p. at one-hour rating. The machine has a total length of approximately 108 ft. and is provided with a driving cab at each end, so that reversing or the use of turntables is unnecessary.

London.—NEW ESCALATORS.—Either King's Cross station or St. Paul's station will have the 150th escalator to be placed in service by the London Passenger Transport Board. The Board now owns 143 escalators, with a total length of nearly 2½ miles, and reconstruction schemes at King's Cross and St. Paul's include five new escalators at each station. A special census just made shows that since escalators took the place of steps between the Northern City Line and the Northern Line at Moorgate the interchange traffic has increased from 1,300,000 to 1,718,000 a year. When improvements at Moorgate have been completed the traffic will, it is expected, increase to 2,000,000 a year. In addition to the ten escalators now in hand, plans are being prepared for thirty-six more, bringing the total number to 189.

VAUXHALL CROSS IMPROVEMENTS.—Traffic congestion at Vauxhall Cross, a particularly busy junction, will be relieved by a scheme in which the London Passenger Transport Board is co-operating with the London County Council. The work consists of a traffic diversion affecting Upper Kennington Lane, Vauxhall Station Yard, Parry Street and a section of Wandsworth Road. In Parry Street a new bridge has been built to carry the Southern Railway main line. At present five main roads, each carrying a double line of conduit tramway, converge at Vauxhall Cross, and the L.P.T.B. is making extensive alterations to the tracks. Permanent-way work now in progress includes the construction of a third of a mile of new single track, the installation of three new crossovers and seven new junctions, and the removal of the complicated junction at Vauxhall Cross.

Manchester.—ELECTRIC RAILWAYS.—The Manchester Regional Town Planning Committee has decided to place before the Advisory Committee a proposal from Councillor Shaw (Urmston) for the setting up of a temporary joint regional transport commission to consider an underground railway for Manchester and Salford and the electrification of railways in the Manchester area.

Southern Railway.—ELECTRIFICATION DEFENDED.—The company's electrification policy is upheld by Mr. G. Szlumper, C.B.E., the general manager, in an article in the December issue of the *Railway Stockholder*. The benefits of electrification have made themselves so patent to travellers, traders and property owners generally, he says, that deputations from non-electrified areas frequently wait upon the company to urge their claims for electrification so that they, too, may enjoy its advantages. He contends that modern electric rolling stock is just as comfortable as steam trains from the point of view of smoothness of travel, and states that so far as speed is concerned each electric service is faster than the steam service it displaces. With regard to criticisms of the multiple-unit, conductor rail system, he says that the company is fully aware of the advantages of electric locomotives under certain conditions, but is satisfied that the multiple-unit system is better for the areas already electrified or being electrified. One great advantage is that it enables more trains to be run into terminal stations, a point which cannot be overstressed in view of the impossibility of enlarging the London termini except at a prohibitive cost. Viewed in its proper perspective electrification is a comparatively inexpensive method of increasing track capacity and, therefore, the earning power of the company.

Communications

Great Britain.—SUCCESS OF T.I.M.—Mr. J. H. Brebner, the Post Office controller of Press information and publications, speaking on Monday to the East Grinstead Chamber of Commerce, stated that the speaking clock had produced approximately £85,000 additional revenue in answering nearly 20 million requests for the time, since the inception of the service last year. Its success had decided the Post Office to extend the time service by means of trunk lines to Manchester, Edinburgh and Glasgow at first, then to other centres as additional equipment became available.

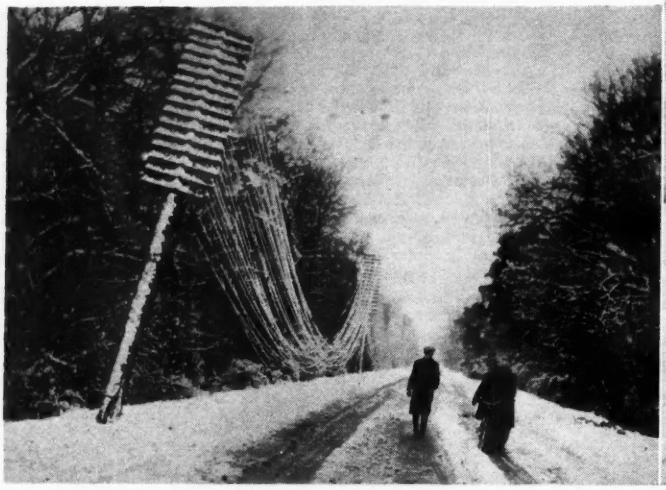
TELEVISION.—It is reported that Baird Television, Ltd., in conjunction with the Gaumont-British Picture Corporation,

Ltd., intends to install television equipment in fifteen London cinemas. A pre-view has already been given at the Palais de Luxe, Bromley.

TELEPHONE COMPARISONS.—According to Post Office Green Paper No. 37 telephone charges in this country compare favourably with those in other countries. In New York a residential subscriber cannot get a telephone for less than £10 10s. a year; in London the cost is £5 4s. A business subscriber in New York making 300 calls a quarter pays £18 a year; in London he pays £12 12s. Only the U.S.A. and Germany have more telephones than Britain, but in terms of the number of telephones per 100 of the population this country ranks only ninth with 5.1, the U.S.A. being first with 13.4. The total telephone revenue in Britain is at present about £27,000,000 a year. Rentals account for £11,000,000, local call fees £9,000,000 and trunk call fees £7,000,000. The net increase in the number of telephone stations is at the rate of 250,000 a year. In 1930 only 300 automatic exchanges were working; now there are over 2,000.

MALAYA SERVICE.—A public telephone service is now available between all parts of this country and Malaya. It is available in Malaya to most of the principal places in the Straits Settlements, Federated Malay States, Johore, and Kedah. Calls may be booked for connection between 9.30 a.m. and 2.30 p.m. daily, except Sundays and public holidays. The charge is £1 15s. a minute, with a minimum of three minutes.

The violence of the snowstorm which broke over parts of the southern counties last week is shown by the accompanying photographs taken near Lyndhurst. Many telephone exchanges were isolated



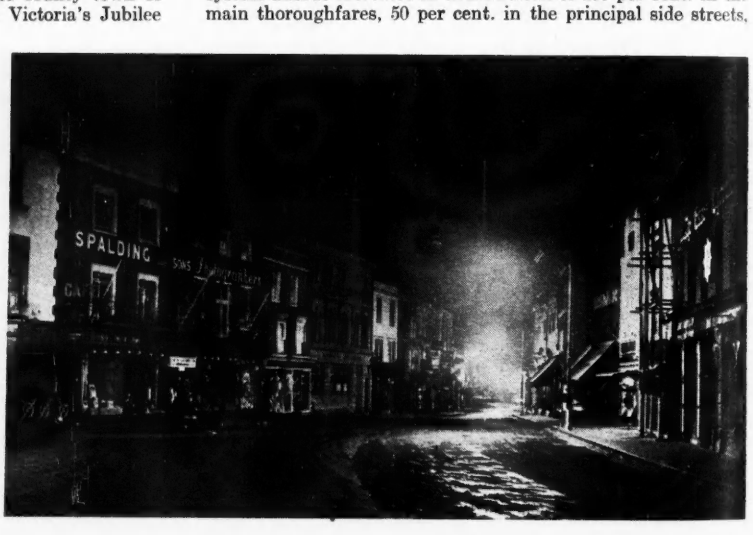
Russia.—EXTENSION OF TELEPHONE SYSTEM.—The People's Commissariat of Communications is carrying out work on the construction of new telephone exchanges and the reconstruction of existing ones in forty-nine towns. New automatic telephone exchanges ranging from 4,000 to 10,000 lines in Moscow and Leningrad are included.

Chelmsford Reverts to Electric Lighting

ON Monday last an up-to-date system of electric street lighting was officially inaugurated in Chelmsford. Street illumination by electricity is not new to the county town of Essex, however. On the occasion of Queen Victoria's Jubilee an installation of electric arc lamps was provided by Crompton & Co. and four or five years later a system of street lighting consisting of arc lamps on wooden poles was introduced. Electric lighting, subsequently by metal filament lamps, continued until 1920, when gas lamps were substituted by the Council, which had taken over the gas undertaking in its area.

Recently the County of London Electric Supply Co., Ltd., which assumed control of the undertaking of the Chelmsford Electric Supply Co., Ltd., in 1934, was permitted to provide a demonstration installation. In collaboration with the British Thomson-Houston Co., Ltd., part of London Road was equipped with 400-W electric-discharge lamps in refractor lanterns and one of the side streets with 150-W gas-filled lamps in "County Junior" lanterns.

High Street, Chelmsford, lighted by B.T.H. "Mercra" electric-discharge lamps in "Dilen" lanterns



Having inspected the experimental installations the Council invited the County Co. to submit an offer for a complete system of electric lighting in place of the 760 gas lamps then in use. A scheme was prepared for the installation of B.T.H. "Dilen" lanterns, 400-W "Mercra" lamps and control equipment by the same company in the centre of the town and main road junctions; similar 250-W equipments in the principal main roads giving access to and traversing the town; and "County Junior" lanterns with 190-W "Mazda" lamps in the side streets and residential thoroughfares. A contract (including equipment, supply of electricity, and maintenance) for fifteen years was then approved by the Council.

The scheme covers approximately 40 miles of streets lighted by 187 discharge lamps and 637 gas-filled lamps, all controlled by solar dial time switches. It is estimated that the new system affords increases in illumination of 100 per cent. in the main thoroughfares, 50 per cent. in the principal side streets, and 33⅓ per cent. in the remaining streets, the standard of the new installation being above the requirements of the recent Report issued by the Ministry of Transport.

The Mayor of Chelmsford (Councillor J. T. Bellamy) presided at the inaugural dinner at Cannon's Restaurant. An electric-discharge lamp had been erected in the restaurant and this was switched on by the Mayor to represent the inauguration of the street lighting. The toast of "The Borough of Chelmsford," was proposed by Mr. J. C. Dalton (County of London Co.), who paid a tribute to the Council's progressive policy. Response was made by the Mayor and Councillor S. C. Taylor. Alderman F. Fox proposed "Success to the New Street Lighting Installation," to which Messrs. H. A. Lingard (B.T.H. Co.) and J. H. Laidlaw (County Co.) replied.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdeen.—December 21st. County Council. Electrical work at thirty houses at Cruden Bay. Tawse & Allan, 10, Bon-Accord Square.

Aberystwyth.—January 18th. Electricity Department. Kiosks and sub-station equipment. (See this issue.)

Australia.—MELBOURNE.—January 11th. State Electricity Commission of Victoria. Aerial cable for one year. (T.Y. 28804/37.)*
January 18th. Cables. (T. 31312/37.)*
February 1st. Two 35,000-kVA transformers. (T. 31186/37.)*

Blackpool.—December 22nd. Borough Council. Two electric passenger lifts at the proposed bus and car parking station, Talbot Road. Borough surveyor, Talbot Square.

Bristol.—December 20th. Airport Committee. Night flying equipment, consisting of boundary and obstruction lights, cable, wiring, jointing and control switches. Airport Manager's Office, Bristol Airport, Whitchurch.
December 29th. Port Authority. 15,000 yd. of e.h.v. cable at the Avonmouth and Royal Edward docks. (December 3rd.)

Buxton.—December 21st. Borough Council. Extension of the e.h.v. transmission system by underground and overhead cables. (December 10th.)

Cannock.—December 18th. U.D.C. Electricity Department. Twelve months' supply of cables and meters. (December 3rd.)

Cardiff.—December 21st. R.D.C. Electricity Department. 3/10-cwt. vehicle propelled by a petrol or oil engine and/or an 3/10-cwt. electric battery vehicle. H. Jackson, Council's electrical engineer and manager, Park House, 20, Park Place (deposit 5s.).

Driffield (EAST YORKS).—January 11th. R.D.C. Electrically driven pumping machinery at the Hutton pumping station and the booster stations at Garton and Wetwang. (December 10th.)

Eastbourne.—January 14th. Electricity Committee. Electrical materials for twelve months; also wiring for hire and hire-purchase apparatus and for assisted wiring installations. (See this issue.)

Epsom and Ewell.—December 28th. Electricity Department. L.v. cable. (December 10th.)

Failsworth.—December 21st. U.D.C. Electric lighting and power at thirty-two houses on the Dean Street site and twenty-two houses on the Wrigley Head site. J. W. E. Brown, Council's surveyor, Town Hall.

Great Yarmouth.—December 20th. Town Council. Additional wiring and electric lighting fittings and extension of the existing hot water system at the Alderman Swindell school, Beresford Road. Olley & Haward, architects, Queen Street.

Lancashire.—January 10th. County Council. Electrical installations at the new technical college, Stretford. Particulars from S. Wilkinson, county architect, County Offices, Preston (deposit £2), by December 17th.

London.—ISLINGTON.—January 12th. Borough Council. Electrical and engineers' stores for one year. (December 3rd.)

Lymington.—December 22nd. Town Council. Electric motor or, alternatively, crude oil engine or gas engine, air compressor, piping and accessories, at the Ampress waterworks pumping station. Lemon & Blizard, Lansdowne House, Castle Lane, Southampton (deposit £2 2s.).

Merton and Morden.—December 29th. U.D.C. Vehicle actuated traffic signals in Merton High Street. (See this issue.)

Newport (MON).—January 3rd. Corporation. Electrical installation at the Maindee Baths. (December 10th.)

New Zealand.—WELLINGTON.—February 10th. Posts and Telegraph Department. Galvanised steel wire. (T.Y. 28843/37.)*

Oxford.—City Council. Electrical installation in the new Isolation Hospital, Horspath. (December 10th.)

Portland.—December 27th. U.D.C. Cable, joint boxes and cover boards or tiles. (December 10th.)

Salford.—January 12th. City Council. One 15,000-kVA transformer, fitted with automatic on-load tap changing equipment. (See this issue.)

Sheffield.—January 10th. Electricity Committee. Natural draught cooling tower. (December 10th.)

South Africa.—PRETORIA.—December 30th. Public Works Department. One 50-kVA transformer, with h.v. and l.v. switches. (T.Y. 28691/37.)*
BLOEMFONTEIN.—January 3rd. Electric Supply Department. E.h.v. and h.v. switchgear, three 500-kVA and three 250-kVA transformers and p.i., l.c. cable. (T. 28916/37.)*
KRUGERSDORP.—January 3rd. Electricity Department. Four three-phase, oil-filled, indoor type transformers. (T. 28932/37.)*
JOHANNESBURG.—January 24th. Railways and Harbours Administration. One 90-ft. electrically driven turntable, complete with motor. (T.Y. 28930/37.)*
PORT ELIZABETH.—January 27th. Municipality. One 4,000-kVA transformer, ten 22,000-V, three-phase circuit-breakers and one ring main unit; also l.c. and armoured cable, cable end boxes, joints, &c. (T.Y. 31398/37.)*

Swinton and Pendlebury.—December 20th. Borough Council. Electrical installation at open-air school. H. Bennett, architect, 1, Chester Terrace, Regent's Park, London, N.W.1.

Urmston.—December 20th. U.D.C. Street lighting scheme, including weldless steel lighting columns and brackets, h.p. mercury-vapour or sodium lanterns and accessories and wiring of columns, underground cables and incidental works. Engineer and surveyor, Council Offices.

Uruguay.—MONTEVIDEO.—January 28th. State Electricity Supply and Telephones Administration. Twenty-six three-phase, oil-cooled, static transformers. (T.Y. 31390/37.)*

Wallasey.—January 18th. Borough Council. P.i., l.c. cables. (December 10th.)

Walton and Weybridge.—January 10th. U.D.C. Electricity Department. One transformer kiosk, e.h.v. switchgear and ring main controller; also l.v. feeder pillars and two 300-kVA transformers. (See this issue.)

Wolverhampton.—January 1st. Corporation Water Undertaking. Electrically driven pumping plant, comprising duplicated river, well and forcing sets of 13-, 75- and 337-w.h.p. each, and driven by variable-speed l.v. and h.v. a.c. motors, together with transformers, switchgear, cranes, &c., for the Cosford waterworks reconstruction. Water engineer and manager, Town Hall (deposit £2).

Worthing.—January 3rd. Borough Council. Street lighting equipment, including concrete lamp columns and time switches. (See this issue.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Australia.—MELBOURNE.—City Council. Accepted. Auxiliary switchgear for the conversion of an existing rotary convertor switch to suit No. 7 turbo-generator set and the conversion of two existing switches from 800-A to 1,200-A capacity (£2,554).—A. Reyrolle & Co.—*Tenders.*

Barrhead.—Town Council. Accepted. Electric lighting at sixty-eight houses.—R. J. Sinclair.

Bradford.—Electricity Committee. Recommended. Overhead lines in the Allerton district.—B.I. Cables. Two 7½-ton electric cranes.—Middleton Bros.

Brighton.—Electricity Committee. Accepted. C.i. pipes for extension of circulating water system at Southwick power station.—Aiton & Co. (£943); Stanton Ironworks, Ltd. (£393). Ring main from Hone Street to Kemp Town.—Siemens Bros. Panels and instruments for the boilers for the 1935 power station extensions (£3,359).—Allen West & Co. Two 1,500-kVA transformers for the Southwick station.—British Electric Transformer Co.

East Ham.—Electricity Committee. Recommended. Meter boards for twelve months.—Henley's. House service cable.—Liverpool Electric Cable Co. Emergency battery (£309).—Hart Accumulator Co.
Health Committee. Accepted. Electrical installation at central clinic and offices (£1,086).—Davis Contractors, Ltd.

Glasgow.—Electricity Committee. Recommended. Two 6,000-kVA transformers (£4,675).—Bruce Peebles & Co.

Hastings.—Electricity Committee. Recommended. Switch and transformer kiosk for Broomhill sub-station (£303).—W. Lucy & Co.

London.—L.C.C.—Accepted. Wiring and fittings for electric lighting, &c., in one block of dwellings on the Evans' Cottages area, Lambeth:

	£		£
Holliday and Son (Electrical). Accepted	**311**	E. W. Merredew	373
Samuel Reed and Sons	313	Coleby and Co.	401
Carr Brothers	332	Gladwell and Cook	403
Archibald Meckhonik	337	Commercial Light, Heat and Power Co.	403
Jacob White and Co.	337	Warren Smith and Co.	446
Read and Partners	352	Northern Electric (London)	596

Three electric passenger lifts at St. Marylebone Institution:

	£		£
Glasgow Engineers, Ltd. Accepted	**2,297**	Pickerings, Ltd.	3,680
Etchells, Congdon and Muir	3,103	Hammond and Champness	3,854
Gimson and Co. (Leicester)	3,337	W. Wadsworth and Sons	3,878
Bennie Lifts, Ltd.	3,467	Evans Lifts, Ltd.	4,020
Express Lift Co.	3,549	J. and E. Hall, Ltd.	4,250
		Waygood, Otis, Ltd.	4,480

Two electric lifts in blocks A and B at the Chelsea Institution:

	£		£
Glasgow Engineers, Ltd. Accepted	**1,459**	Bennie Lifts, Ltd.	2,068
		Express Lift Co.	2,172

Wiring and fittings for electric lighting, &c., in one block of dwellings on the North Avenue area, Islington:—

	£		£
Carr Bros. Accepted	**870**	T. Wescott & Sons	939
Jacob, White & Co.	892	Ellis and Ward	941
Archibald Meckhonik	915	Gladwell and Cook	992
Pinching and Walton	920	Ilford Electrical Co.	1,124
Buchanan and Curwen	929	J. H. Golding	1,404

HAMMERSMITH. — Electricity Committee. Recommended. 2,200-V, single-phase, metal-clad, air-insulated switches (rupturing capacity 50,000-kVA) for three years (maximum price of £68 5s. per switch).—Ferguson, Pailin.

SOUTHWARK. — Electricity Committee. Accepted. Three feeder pillars (£158).—W. Lucy & Co. Cables for twelve months.—Britannic Electric Cable & Construction Co., Ltd.; Ismay Cables, Ltd.

Northamptonshire.—Public Assistance Committee. Accepted. Electric lighting in the new nurses' home, Kettering (£170).—Hutchings & Cunnington.

Plymouth.—Electricity Committee. Accepted. Meter-testing equipment (£853).—Ferranti, Ltd.

Rotherham.—Transport Committee. Recommended. Rectifier equipment.—Hewittic Electric Co. Lighting fittings for depôt.—Benjamin Electric Co.

Rowley Regis.—Accepted. Electrical installations in houses on the Codsall Street housing estate (£847).—C. C. Harris. Electrical installations in houses on the Wagon Street housing estate (£104).—T. R. Priest.

Seaton Valley.—R.D.C. Accepted. Electrical installations at 250 houses at Backworth and 314 houses at Shiremoor.—Graham Berry. Electrical installations in seventy-two houses at Holywell.—R. W. Leek & Co.

South Shields.—Town Council. Accepted. Switchgear in connection with the second year's instalment of the reorganisation of the electricity undertaking at a cost of £12,000.—A. Reyrolle & Co. Electrical installations at the Girls' High school.—A. J. Wares, Ltd.

Torquay.—Electricity Committee. Accepted. Transformers and switchgear (£63,661).—B.T.H. Cables for h.v. transmission scheme (£12,502).—Pirelli-General Cable Works. Overhead lines for transmission scheme (£34,017).—Callender's.

Warrington.—Electricity Committee. Accepted. E.h.v., l.v., and other cables.—B.I. Cables. Earthenware conduits.—Albion Clay Co. Reinforced cable protector slabs and tiles.—S. H. Bonsall.

Wolverhampton.—Electricity Committee. Accepted. Three sets of testing plugs (£121).—A. Reyrolle & Co. Three switch units (£658).—Ferguson Pailin.

Worthing.—Electricity Committee. Accepted. Three transformers (£493).—Yorkshire Electric Transformer Co.

Forthcoming Events

Institution of Electrical Engineers.—Monday, December 20th. Institution, London, W.C.2. 7 p.m. Informal meeting. Discussion on "Do the Domestic Electrical Appliances of To-day Properly Serve Their Users?" To be opened by Mr. R. W. Minter.

Birmingham Electric Club.—Monday, December 20th. Grand Hotel, Birmingham. 7 p.m. Annual general meeting.

Association of Supervising Electrical Engineers.—Tuesday, December 21st. E.L.M.A. Lighting Service Bureau, Savoy Hill, London, W.C.2. 7.15 p.m. "Electricity Regulations in Relation to Factory Electrical Equipment." Mr. H. W. Swann.

Manchester Branch.—Tuesday, December 21st. Branch meeting of members.

Notes

Northampton Polytechnic Prize Distribution

The annual prize distribution and conversazione of the Northampton Polytechnic, E.C.1, was held on Friday and Saturday last when Mr. S. C. Laws (the principal) in revising the work of the Polytechnic during the past year mentioned that the number of students in attendance was 3,676, an increase of 438 as compared with the previous year, and the highest

Christmas gifts for over seventy beneficiaries of the Electrical Industries Benevolent Association. Chocolates, cigarettes and money being packed at the Association's offices

in the history of the Polytechnic. The extent of the expansion during the last decade could be seen by comparing the present enrolment with the corresponding figure of 2,291 in 1926-27. The number of students was thus higher by nearly 60 per cent. than ten years ago. Of last year's total, 217 students attended senior full-time courses, while fifty-eight boys were under instruction in the junior technical school, 3,213 students attended evening classes, and 188 attended part-time day classes. In the internal examinations twenty-six students were awarded the Polytechnic Diploma, and 327 received course certificates. Similarly, class certificates were awarded to 587 evening students. In the external examinations thirty-seven students obtained the degree of B.Sc. (Engineering) of London University, and one evening student was awarded the degree of M.Sc. (Engineering). He expressed the gratitude of the Governors to those engineering firms who offered facilities to the students for industrial experience during the past summer. Following Mr. Laws' report, Sir Stanley Machin (past-president of the London Chamber of Commerce) gave a short address and presented the awards to the students. On the following day the Polytechnic was open to visitors to view the work of the students, while on the social side there were a gymnastic display, boxing matches, badminton matches, extracts from light opera by the Polytechnic Operatic Society, and dancing. Callender's Cable & Construction Co., Ltd., arranged a special display of its range of cables.

E.A.W. Activities

Twenty-five of the eighty people attending the inaugural meeting of the Barnet Branch of the Electrical Association for Women on December 8th joined the Branch and others will join shortly. Mrs. Bentham, chairman of the London Branch, presided and Miss Caroline Haslett, director of the E.A.W., outlined the work of the Association, supporting the formation of the Branch. Mr. H. P. Guy, the Barnet engineer of the Northmet Co., spoke on electrical matters in general, and Councillor C. E. Green said that he calculated the cost of electricity in his all-electric home at 2¼d. per person per day. Lady Glover was elected president. The hon. secretary is Miss P. J. Eatock, 26, Ravenscourt Park, Barnet.

Thirty members of the Croydon Branch visited the Ealing works of Arrow Electric Switches, Ltd., last week. Great interest was shown in the manufacture of cooker switches, cooker control units and switches for other domestic appliances largely used by women.

The Physical Society's Exhibition

The twenty-eighth annual exhibition of scientific instruments and apparatus, arranged by the Physical Society, will be held at the Imperial College of Science and Technology, South Kensington, from January 4th to January 6th. The leading manufacturers of scientific instruments will be exhibiting their latest products in the Trade Section. The Research and Educational Section will contain contributions from research laboratories and experiments of educational interest. In addition, the work submitted for the Craftsmanship and Draughtsmanship Competition by apprentices and learners will be on view. Discourses will be delivered by Capt. G. C. Damant, C.B.E., R.N., on "Diving in Deep Water and Shallow," and by Prof. A. F. C. Pollard, A.R.C.S., A.M.I.E.E., on "The Mechanical Amplification of Small Displacements." Admission to the exhibition is by ticket only. Members of institutions and scientific societies may obtain tickets from their secretaries; tickets may also be obtained direct from the Exhibition Secretary, 1, Lowther Gardens, Exhibition Road, S.W.7.

E.P.E.A. (Tees-side Section)

Speaking at the annual dinner and dance of the Tees-side section of the E.P.E.A. at Middlesbrough last week Mr W. F. T. Pinkney, assistant general manager of the North-Eastern Electric Supply Co., Ltd., stated that last year his company spent £157,000 in capital on Tees-side and in Cleveland. Orders placed on Tees-side this year by his company amounted to £75,000. The energy generated on Tees-side represented 20 per cent. of the total generated by the North-Eastern company.

London Students' Dance

There was a large attendance despite the inclement weather at the annual dance of the London Students' Section of the Institution of Electrical Engineers, held last Friday at the Imperial Hotel, London, W.C., and we hope that this increase in enthusiasm will also permeate the Section's ordinary meetings. We were told that the membership has increased by 9 per cent. to 2,000. Credit for the success of this function goes to Mr. A. H. Young, the hon. asst. secretary of entertainments.

Appointments Vacant

Assistant mains superintendent, service engineer, junior mains draughtsman and male clerk for Walsall Electricity Department.

Meter repairer for Stoke-on-Trent Electrical Engineer's Department.

Switchboard attendant for the London Power Co.

Technical assistant (electrical engineer) for the Royal Arsenal, Woolwich.

Meter tester and repairer for the Grampian Electricity Supply Co.

Meter tester and repairer for Louth Electricity Department.

(See our Classified Advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

DUCHESS pocket lamp battery (Maxivee 747).

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

The dinner which, as already announced, is being arranged in honour of **Mr. J. W. Beauchamp,** is being held at the wish of many of his friends who are desirous to have an opportunity to pay tribute to his valuable pioneer work in connection with the development of the use of electricity for domestic purposes, both as a municipal engineer and as the first Director of the British Electrical Development Association. It will take place at the Waldorf Hotel, London, on January 11th (7.15 for 7.30), with Mr. R. P. Sloan, C.B.E., a Past-President of E.D.A., in the chair. Many members of the E.D.A. Council from the inception of the Association in 1919 will be present, and an invitation is cordially extended to any other persons in the industry who desire to be associated with this tribute. The price of tickets, fixed at 25s. each, includes a contribution towards a presentation which will be made to Mr. Beauchamp during the dinner. Early application for tickets should be made, at the latest before December 31st, to Mr. A. C. Cramb, British Electrical Development Association, 2, Savoy Hill, London, W.C.2, as it is desired to complete the necessary arrangements without delay.

Mr. L. A. Gripper, A.M.I.E.E., deputy borough electrical engineer at Eastbourne, has been appointed borough electrical engineer and manager at Beckenham. Prior to going to the Eastbourne undertaking in March, 1933, he held the position of distribution superintendent at Croydon. He served as a pupil with Blackburn Corporation Electricity Department, and upon returning from foreign service at the end of the war he joined the Newcastle Electric Supply Co., and subsequently held positions with the English Electric Co., the North Metropolitan Electric Power Supply Co., and the Croydon Corporation. While at Croydon Mr. Gripper took a keen interest in teaching work and was, for a number of years, a lecturer to evening electrical classes at Croydon Polytechnic. He has on various occasions contributed articles to the ELECTRICAL REVIEW, particularly in connection with cable jointing, and is a member of the British Electrical Development Association's Neon Sign and Street Lighting Committees. He takes up his new position at Beckenham on January 4th.

Mr. L. A. Gripper

Major J. L. Kotalawela, Minister of Communications, Ceylon, is in London on a brief visit. While in this country he is to make preliminary arrangements for the placing of contracts in connection with the proposed hydro-electric scheme for Ceylon and he is also to consult the B.B.C. regarding the installation of a second broadcasting transmitter in Colombo.

Mr. J. Urmston, assistant mains superintendent to the Guildford Corporation, has obtained a position with the Blackpool Corporation.

Colonel A. P. Pyne, M.I.E.E., chief engineer of Ismay Cables, Ltd., has been appointed to the board of the company.

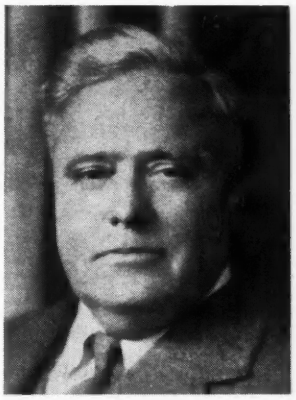
[*Balmain*

Mr. J. Eccles

Mr. J. Lingard, A.M.I.E.E., is retiring from the position of chief assistant engineer in the Edinburgh Corporation Electricity Department after twenty-nine year's service. The position of chief assistant engineer has been abolished and that of deputy engineer and manager substituted therefor. **Mr. J. Eccles,** B.Sc., M.I.E.E., A.M.I.Mech.E., senior technical assistant, has been promoted to the new post and takes up his new duties on January 16th.

Mr. N. Brooksbank, chief London engineer of the Victoria Falls and Transvaal Power Co., Ltd., sailed in the *Athlone Castle* on December 10th on a visit to Cape Town and the Victoria Falls, Rhodesia. He expects to return to London during April.

Mr. C. F. Johnston has been appointed a director of the Union Lamp and Lighting Co., Ltd. Born in America of British parents, he was educated as an engineer at Columbia University, New York. After leaving the University he joined the Edison Lamp Works of the General Electric Co. of New York. He remained with this and associated companies, except for the war period, until 1925, his service including four years in Japan and China. During the war he served with the United States regular army. From 1925 to 1930 he sat on the general board of the General Patent and Business Development Agreement, otherwise known as the International Incandescent Lamp Cartel, with offices in Paris. In 1930 he joined the Cie. des Lampes, Paris, as export manager, and in 1934 moved to London and became a director of British Tungsram Radio Works, Ltd. He joined Philco in 1935, in charge of the Valve and Equipment Department, and later became merchandising manager, which position he resigned in October, 1937.

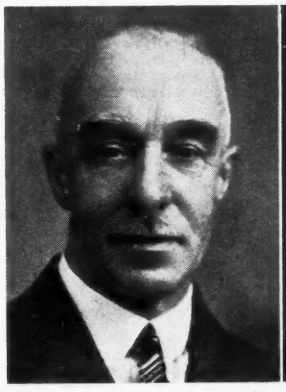


Mr. C. F. Johnston

Mr. F. C. Leach has been appointed to the board of the Western Electric Co., Ltd., as commercial director, and **Mr. N. E. Lovell,** assistant sales manager, has been appointed sales manager.

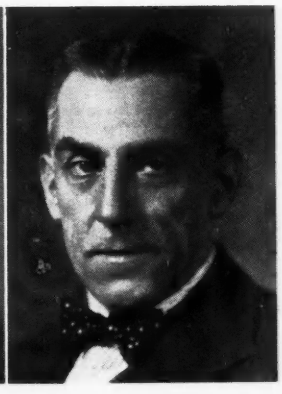
Mr. C. Baguley, who is acting as advisory engineer to Malayan Collieries, Ltd., has just returned to this country from a visit to the property which is situated in Selangor, F.M.S. Mr. Baguley has been previously in the Dutch East Indies and West Africa and on the Rand. Since July this year he has been acting on his own account at 11, Queen Victoria Street, E.C.4.

To mark the retirement at the end of this year of **Messrs. F. Woollard,** A.M.I.E.E., and **G. Brown,** A.M.I.E.E., the Telephone Development and Maintenance Branch of the Engineer-in-Chief's Office, Post Office Engineering Department, held a dinner and dance in their honour at Thames House Restaurant on December 7th. The chairman was Mr.



[*Miles & Kay*

Mr. G. Brown



[*Elliott & Fry.*

Mr. F. Woollard

I. H. Jenkins, M.I.E.E. (staff engineer, T.D. and M. Branch), and among the 250 present were Mr. B. O. Anson and Mr. P. J. Ridd (assistant engineers-in-chief) and several representatives of concerns engaged in the telephone industry. Mr. Woollard entered the service of the National Telephone Co. in 1895 and was intimately connected with the early stages of telephony in London, including the conversion of subscribers' lines from earth-return circuits to metallic loops. He has been concerned with each subsequent change of system. Until 1924 he was engaged in the London Engineering District on the construction and maintenance of telephone plant. He was then transferred to the Engineer-in-Chief's Office, and has since 1931 been assistant staff engineer in charge of telephone maintenance. Mr. Brown's connection with telecommunications dates back to 1901, when he joined the staff of the chief electrician to the Glasgow Corporation Telephone Department. He was transferred with that

The engineers responsible for the load-building activities in the East End of London (see page 845): Mr. R. Illingworth, Poplar (Jerome); **Mr. E. E. Jolly, Bethnal Green** (Elliott & Fry); **Mr. W. Weekes, Shoreditch** (Art Portraits); **Mr. P. C. Ebner, Shoreditch** (Elliott & Fry); **and Mr. A. E. Campbell, Stepney** (Whitlock).

organisation to the Post Office in 1906. Since his transfer to the Engineer-in-Chief's Office in 1924 he has been concerned mainly with the design and development of automatic switching plant, and as executive engineer in charge of the preparation of standard specifications he has taken an active part in the working of the British Telephone Technical Development Committee.

The chairman, in proposing the toast of "The Retiring Officers," referred to the many remarkable changes in telecommunications which have taken place during their period of service, the number of telephones in London having grown from 12,000 to 1,000,000. He testified to the excellent qualities and past services of these two telephone engineers and wished them long life, health and happiness in their retirement. Other speakers on the toast list joined in paying tribute to the guests of honour.

Mr. R. B. Stirrup, at present with the Liverpool Corporation Electricity Department, has been recommended by the Liverpool Electric Power Committee for the appointment of chief electrical assistant at a salary of £650, rising to £750, per annum.

Obituary

Mr. A. E. Drowne.—The death is reported of Mr. Arthur Edward Drowne, aged sixty-six years, which occurred on December 10th. Mr. Drowne was for thirty-five years secretary to the Windsor Electrical Installation Co., Ltd.

Joseph Hetherington.—In line five, column 2 (p. 837), in our last issue, it should have been stated that the late Mr. Hetherington was engaged on the engineer's staff of the London Electric Supply Corporation in 1890, *not* in 1899.

Will.—Mr. William Guy-Pell, M.I.E.E., founder of William Geipel, Ltd., left £108,227, with net personalty £99,272. He left, subject to life interests, £18,000 divisible between various organisations—one-sixth of this amount being bequeathed to the Institution of Electrical Engineers for scholarships as well as £100 to the Benevolent Fund of the I.E.E.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Farr's Electric, Ltd.—Private company. Registered December 10th. Capital, £1,000. Objects: To carry on the business of dealers in and manufacturers of radio, television and sound reproducing apparatus, &c. The directors are: T. G. Farr, St. Regis, Cork Street, Mayfair, W.1, and S. Green, 23, Wellington House, Western Avenue, Ealing. Secretary: E. E. Mills.

Spelling Signs, Ltd.—Private company. Registered December 11th. Capital, £3,000. Objects: To carry on the business of manufacturers, erectors and maintainers of neon, daylight, box, metal, electric and other signs, &c. The permanent directors are: R. T. Riches and Geoffrey H. Riches, both of 12, Canon Road, Bromley, Kent, and two others.

Workman, Reed & Co., Ltd.—Private company. Registered December 8th. Capital, £2,500. Objects: To acquire the business of a merchant and factor of electrical goods carried on by F. E. R. Reed at 1, Blackhorse Road, Kingswood, Bristol, as the Regent Electrical Co., and to acquire the benefit of the distributing agency in respects of goods of Petters, Ltd., now held by E. A. Workman. The permanent directors are: E. A. Workman, "High Cleve," Weston-super-Mare; and F. E. R. Reed, "Springfield," Memorial Road, Harham, Bristol.

Alpha Light, Ltd.—Private company. Registered in Dublin December 2nd. Capital, £2,000. Objects: To carry on the business of general dealers in electrical, radio and telegraph apparatus and goods of all kinds, &c. The subscribers are: T. Jackson and F. Moiselle, both of 11, Stephen's Green, Dublin.

Returns of Electrical Companies

Eckington Electric Supply Co., Ltd.—Capital, £5,000 in £1 shares. Return dated August 18th, 1937. All shares taken up. £5,000 paid. Mortgages and charges nil.

Little Lever Radio Relay Co., Ltd.—Capital, £500 in £1 shares. Return dated September 25th, 1937. 300 shares taken up. £300 paid. Mortgages and charges nil.

L. W. Douthwaite & Co., Ltd.—Capital, £7.000 in £1 shares. Return dated August 4th, 1937. 5,519 shares taken up. £1.321 paid. £4,198 considered as paid. Mortgages and charges: £3,000.

Sedwin Electric, Ltd.—R. W. Smith, of 39-41, Earl Street, Maidstone. ceased to act as receiver and/or manager on December 6th, 1937.

Moreland Electric Welding Co., Ltd.—Capital, £4,000 in £1 shares. Return dated October 27th, 1937. 2,302 shares taken up. £2,302 paid. Mortgages and charges, nil.

Oliver Pell Control, Ltd.—Charge on 4 and 8, Cambridge Place, Plumstead, S.E.18, dated November 26th, 1937, to secure £650. Holders: Kent Reliance Building Society, Thomas Street, Woodwich.

Birmingham Insulators, Ltd.—H. Jones, of 55, Newhall Street, Birmingham, ceased to act as receiver and/or manager on November 10th, 1937.

British Electric Traction Co., Ltd.—Satisfaction in full on November 18th, 1937, of mortgage dated November 19th, 1912, and registered November 21st, 1912, securing £20,000.

Bogota Telephone Co., Ltd.—Capital, £300,000 in £1 shares. Return dated November 29th, 1937. 258,493 shares taken up. £245,993 paid. £12,500 considered as paid. Mortgages and charges, nil.

Nigerian Electricity Supply Corporation, Ltd.—Capital, £500,000 in 450,000 preferred ordinary shares of £1 and 200,000 ordinary shares of 5s. Return dated August 11th, 1937. All shares taken up. £450,076 15s. paid on 450,000 preferred ordinary and 307 ordinary shares. £49,923 5s. considered as paid on 199,693 ordinary shares. Mortgages and charges, £198,988.

City Notes

The Brush Electrical Engineering Co., Ltd., reports a deficit of £63,363 for the eighteen months period. This figure is arrived at after providing for general charges, interest on debenture stocks, and the maintenance and depreciation of plant and buildings. In addition the directors have considered it advisable to write off expenditure incurred in the development of large turbine manufacture amounting to £25,526. The deficit of £12.989 brought forward at December 31st makes a total debit balance to be carried forward of £101.879.

Presiding at the annual meeting on December 13th, Mr. H. E. Midgley (acting chairman), said that the company had turned the trading loss of £19.000 for the year ended December 31st, 1935, into a trading profit of £29.971 for the eighteen months to June 30th, 1937. They had been fortunate in securing the support and advice of Mr. A. Miller (appointed a director in February), through whose efforts the company was able to obtain increased banking facilities which enabled them to deal with the vastly increased volume of work going through the shops during the year. While the high quality of their products had been maintained, working costs were high, and the reports of independent consultants confirmed the opinion of the board as to the necessity for substantial new capital expenditure for new tools, equipment and plant organisation. Their large-sized Brush-Ljungström turbine, which was put into operation at the Brighton power station in February last, had proved a success, and had generated more than 110 million kWh to date. When the efficiency they claimed for their new large turbine was officially established, the company would receive its share of the large amount of business placed for such turbines. The second large set for Brighton would be in operation within the next four months. The efficiency and reliability of large Brush-Ljungström sets must obtain due recognition, when it was hoped that the works would be steadily engaged in the output of further large sets justifying

the amount originally expended on development and now written off. The electrical section of the business had an increased order book and had contracts over an extended period of years. The entry into the larger sized transformer market had been successful, and the Diesel engine department showed rapid progress, the "Brush-Diesel" continuing to find an ever-widening market. The volume of business in the rolling stock department also continued to increase. The trade position to-day was that the orders in hand were larger than at any time during the past nine years, and the company had made definite progress since the last meeting. The company's current operations were not, at the present time, being conducted at a loss and, subject to additional permanent finance being obtained at a very early date, the company was now turning the corner.

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., held its annual meeting on Tuesday last, when Sir Walrond Sinclair (chairman), who presided, said that although their profits from the past year showed a contraction there had been no falling off in business. Indeed, there was a steady expansion which, however, was offset mainly by the increase of costs resulting from the reconstruction of their factory. It was worth noting that the reconstruction programme to date had cost over a quarter of a million pounds. During 1936 the first part of the programme was in progress, consisting mainly of the erection of new buildings and the installation of new equipment, and in 1937 the task of moving existing equipment into new quarters and reconditioning existing buildings and plant was carried out. Consequent delays were, unfortunately, extended through the difficulties experienced by their suppliers in obtaining steel and other equipment necessary to complete their deliveries to the company by contract dates.

The speaker referred as follows to what had taken place in regard to the company's cable-making business:—"As you know, in 1935 and 1936 we cut out a great deal of dead wood, involving the closing down of unprofitable branches of the business. In the past year, I am glad to say, only one problem of this kind has arisen. You may know that this company was at one time of great importance in the cable manufacturing industry. For many years now, however, it has been only a small producer of a limited range of products in this class. Your directors made a careful study of the position and it became apparent that to re-establish the company's position in cable manufacture would involve the erection of a new factory with entirely new up-to-date equipment necessitating capital expenditure running well into six figures. An alternative arose in the past year, however, in the form of a proposal by a number of leading cable manufacturers to take over, on equitable terms, the company's present interest in cable manufacture in return for a number of annual cash payments. After careful consideration your board decided to accept this offer, as the terms were, in their opinion, satisfactory, and will ensure a revenue for some years to come, leaving the company free to concentrate in the field of rubber manufacture, where its main interest now lies."

The British Vacuum Cleaner & Engineering Co., Ltd.—Presiding at the annual meeting held on Tuesday last, Mr. H. C. Booth (chairman and joint managing director), said that a further increase, both as regards turnover and profits, had established another record. Owing to the difficulties in obtaining steel and other supplies necessary in the manufacture of their products during the past year they experienced considerable delay in production, thus handicapping for some months plans for further sales development. As a result these were not brought to a successful issue until relatively late in the year. Increased costs of material had also to be overcome in 1937 and the policy that was adopted was one of a more vigorous attack on the market, as an alternative to raising prices, which met with satisfactory results. The question of further increased accommodation had become one of importance in the past twelve months, and since the close of the year under review they had acquired a modern factory between Epsom and Leatherhead, which made available a further covered area of 140,000 sq. ft. with ample room for expansion. The success of their operations covering electric washing machines and electric clocks was encouraging, while the central installations and industrial plant sections had shown increased activity coupled with a substantial turnover. During 1937 they were engaged on installations for boiler sooting plants for the new Fulham power station, the Barton station, Manchester, and others, and their "B.V.C." vacuum cleaner installation activity had covered a large number of plants for the Odeon Cinema circuit, the Prince of Wales Theatre, London, Huddersfield Technical College and Library, and other buildings, in addition to equipment for a number of battleships and the supply of automatic telephone-cleaning equipment for the G.P.O., &c. The operations of their Canadian subsidiary had been successful and had yielded a satisfactory profit. Sales from October last to date showed a substantial increase on those of the corresponding period last year and the present volume of business was such as to require further finance. In this connection it was proposed to hold an extraordinary general meeting to sanction proposals for the extension of the company's borrowing powers, while, at the same time, it was proposed to increase the nominal ordinary share capital.

Claude-General Neon Lights, Ltd., has had under consideration a scheme to reorganise the capital structure of the company in order to enable it more easily to cope with its constantly increasing business. The original capital structure was unusually complicated in that there were three classes of shares—preference, ordinary and founders'. A scheme of arrangement as between the shareholders of the company has now been approved by the Court, under which scheme these three classes will now disappear, and in future there will be one class of share (ordinary) only. The company has introduced a contributory pension scheme open to all employés after three years' service, whereby the employé and the company place equal monthly sums in a fund to provide for the employé's retirement. The management has decided to grant their hourly paid employés a week's holiday on full pay each year.

Vactric, Ltd., reports a trading profit for the year ended September 30th of £38,470, as compared with £44,009 in the preceding year, plus £730 from reserve for liability under service guarantees. After providing for directors' fees, tax, N.D.C., &c., there is a balance of £21,226, to which is added £3,512 brought in. The final ordinary dividend is 10 per cent., making 15 per cent., the new ordinary shares ranking for part of the year only, and the balance carried forward is £3,354. The total ordinary distribution in the previous year was 25 per cent., but was paid on smaller capital. Meeting: December 21st.

Ultra Electric (Holdings), Ltd., has decided to postpone the question of a dividend until after the close of the current financial year. The directors state that in coming to this decision they have had regard to the recent course of trading conditions, both at home and abroad. They add, however, that trading profits for the first half-yearly period approximate to those for the first six months of 1936-37. An interim dividend of 5 per cent. was paid in December, 1936.

Crompton Parkinson, Ltd.—Following the annual meeting on December 10th an extraordinary meeting was held at which resolutions were passed increasing the capital of the company to £1,700,000 and authorising the distribution of a bonus of one "A" ordinary share for every three ordinary and/or "A" ordinary shares held.

E. K. Cole, Ltd.—The directors deem it advisable to defer the consideration of the payment of an ordinary dividend until the end of the company's year (March 31st). An interim dividend of 12½ per cent., less tax, was paid in January last in respect of the previous period of ten months. The final distribution for that period was 17½ per cent., which brought the total up to an equivalent of 36 per cent. per annum.

The Victoria Falls & Transvaal Power Co. has declared a dividend of 3 per cent. on the preference shares for the half-year ending December 31st, and a further dividend of 4 per cent. in respect of the participating rights for 1937. An interim dividend of 4 per cent. is also paid on the ordinary shares. Similar distributions were declared a year ago.

Edmundsons Electricity Corporation, Ltd., reports that the results of the operations of its group of companies during November, as compared with the corresponding month of 1936, show an increase of 17 per cent. of kWh sold.

International Combustion, Ltd., is paying a final dividend of 12½ per cent., less tax, making 20 per cent. (same), plus a bonus of 10 per cent., less tax (same).

Laurence, Scott & Electromotors, Ltd., has declared a dividend on the 5 per cent. cumulative redeemable preference shares for the period July 1st to December 31st.

The London Electrical & General Trust is paying an interim dividend of 2½ per cent., less tax. No interim was paid last year, but the final distribution was 5½ per cent.

The East African Power & Lighting Co., Ltd., has announced an interim dividend of 3 per cent., less tax (same).

Lisbon Electric Tramways has announced an interim ordinary dividend of 3 per cent. net (same).

Bennis Combustion, Ltd., has announced an interim dividend of 5 per cent., less tax (same).

Stocks and Shares

TUESDAY EVENING.

STOCK Exchange markets would probably have undergone more improvement this week had it not been for the sinking on Sunday last of a U.S. gunboat, with three lighters, by Japanese aircraft. This incident, which in days gone by might have provoked a declaration of war, produced due apology and promise of compensation from the Japanese; but even so, Stock Exchange markets regarded it as being of sufficient seriousness for them to move very cautiously in the absence, as it turned out, of active public business. When there is nothing doing in the markets, the disposition is for prices to droop; and for the moment it appears as though the uncertainty in the foreign atmosphere will lead to the attitude of caution being maintained to the end of the year.

Bargains in most of the Stock Exchange markets are now being done for settlement on January 6th, 1938, which means that the prospective purchaser can keep his money in the bank over the year end, and make a fair showing in his pass-book or its equivalent. From the market point of view, an outstanding feature is still the firmness of Cable and Wireless ordinary stock. In the dollar group, Brazilian Tractions spurted sharply on assurance from the President of Brazil that existing rights of foreign investors in the public utilities of the country will be duly protected.

Cable and Wireless

Cable and Wireless ordinary stock, quoted at 66½, retains the advance of 5 points which followed news of possible developments arising from negotiations between the company and the Empire Governments. Dealings in the stock have quietened down pending some definite information as to how the combine's original charter may be expected to be modified. Fresh demand for the preference stock has raised the price a further point to 102½. In reflection of the more hopeful outlook for Cable and Wireless, the prices of Globe Telegraph ordinary and preference are about 2s. 6d. higher, allowing for deduction of the dividends.

Equipment and Manufacturing

Conditions in the electrical equipment market make no exception to the general quietude. No particular reason has been put forward to explain a rather abrupt drop in Aron Meters: the fall to 40s. ex dividend brings the yield, on last year's dividend, to 7½ per cent. Among the dull spots are

General Electrics, which have shed 2s. to 76s., British Insulated, at 4⅜, and Associated Electricals at 44s. There are rises of 1/16 each in Telegraph Constructions, at 2 5/16, and Electric Constructions at 1⅛. Crompton Parkinsons, at 2¼, were not affected by the annual meeting, although the market was pleased with the chairman's review of the position and outlook. The price is ex dividend, but still includes the bonus. Crabtrees, at 26s. 6d., and Switchgear and Cowans, at 16s., are on the easy side. Brush ordinary stock, having been up to nearly 30, came back to 27½ after disclosure at the meeting of the intention to produce a capital reconstruction scheme to be followed by arrangements for fresh finance.

Brighter Brazil

A sharp recovery, to 13¼, in the price of Brazilian Tractions speaks for a generally more hopeful feeling about the future of Brazilion securities under the altered régime. Prices have been widely depressed by the new Dictator's attitude towards his country's financial obligations, and by the possibility of interference with industrial and utility enterprises controlled by outside money. Fears were lightened by unofficial reports of a willingness to negotiate over the matter of the external debt, and of an absence of intention to disturb privately-owned concerns. In the case of Brazilian Tractions, these considerations have enabled the market to give a fairer share of attention to last week's dividend declaration, which, in bringing the total distribution for the year to 1 dollar per share, was regarded as unexpectedly good.

Ever Ready

A fall of 1s. 9d. to 26s. in the 5s. ordinary shares of the Ever Ready Company is due to talk of a cut in prices by one of the other companies dealing with electric batteries, &c. This appeared to get on the nerves, putting it colloquially, of some of the Ever Ready shareholders, who have been rather pressing their shares for sale.

The Ever Ready Company paid 45 per cent. dividend for the year last ended. Prior to that, a dividend of 35 per cent. each year had been declared for seven years, the company's profits expanding continuously throughout that time. Ever Ready shares have paid for some time past a high rate of interest on money invested in them, and the failure of the shares to move on to a plane that would bring them into nearer relation to some of the other electrical manufacturing companies has been a matter for surprise. Possibly the investor may take exception to the reserve fund being invested, so far as is known, partly in the shares of the companies which Ever Ready has from time to time acquired and added to its own interests. A more austere policy in the matter of building-up a gilt-edged reserve has been occasionally recommended as desirable.

Radio Depression

Recognition of the difficult times through which the radio industry is passing had prepared the market for disappointment in the E. K. Cole interim dividend announcement. News of the decision to pay nothing at this stage found the shares already down to 7s. 3d., and resulted in a further setback to 6s. 6d. The distribution of 12½ per cent. at this time last year was followed by a final payment, making 30 per cent. for a period of ten months. Few people are prepared to commit themselves to a forecast of this year's final dividend. The price of the shares has fallen this year from a high mark of 23s. 3d. Dullness spread to other shares of the same kind. Electric and Musical Industries dropped from 18s. to 16s. 3d.; Philcos from 3s. to 2s.; Pye deferred from 13s. 6d. to 10s. 6d. Ultra (Holdings) fell 2s. 3d., to 3s., on the postponement of dividend considerations.

Points of Interest

A certain amount of activity revolves around Westinghouse Brakes and Consolidated Signals as the dividend dates approach. The latter company, having practically no interests apart from its holding in the former, quotations for the two shares commonly move together. This week, however, Consolidated Signals have strengthened further from 5⅜ to 5½, while Westinghouse reacted to 59s. Rumours which have lately been hoisting the price of Ismay Industries were given substance by the official announcement that negotiations for a potentially profitable deal are in progress. The shares now stand at 6s., as against 4s. 9d. a fortnight ago. Allen Wests, at 7s., are still on the up grade, despite the statement that there is no foundation for talk of a coming amalgamation with a larger concern.

Kent Electric Debenture

Kent Electric Power 3½ per cent. debenture stock, issued last month at 96, can be bought at 97, free of stamp and fee, to give a return of £3 12s. on the money. The object of the issue was to finance the construction of the new generating station, which will become a selected station under the grid scheme. The terms on which the company will supply current to the Central Electricity Board make the stock a virtual rent charge of the Board. This security places the stock in the first rank of industrial debentures, and the yield is considered not ungenerous as compared with others in that much sought-after category. Redemption may be effected at par between 1960 and 1975.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price Dec. 14.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	67/6	—	4 9 0
City of London	1	7½	7½	34/–	—	4 8 3
Clyde Valley	1	7	8	2	—	4 0 0
County of London	1	10½	10½	49/–	—	4 5 9
Edmundson's 7% Pref.	1	7	7	33/–xd.	+6d.	4 4 10
Do. Ord.	1	8	9	38/–	—	4 14 9
Elec. Dis. Yorkshire	1	9	9	41/6	—	4 6 10
Elec. Fin. and Securities	1	12½	12½	2⅝	—	4 15 3
Elec. Supply Corporation	1	11	12	52/–	—	4 12 5
Lancs Light and Power	1	7½	7½	33/–	—	4 11 0
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	106½	+1½	4 14 0
Metropolitan	1	10	10	45/–	—	4 9 0
Midland Counties	1	7½	8	37/6	—	4 5 0
Mid. Elec. Power	1	8	9	2 1/16	—	4 7 4
North Eastern Electric Ordinary	1	6	7	32/–	—	4 7 6
Do. 7% Pref.	1	7	7	34/0	–6d.	4 2 4
Northampton	1	10	10	45/–	—	4 9 2
Notting Hill 6% Pref.	10	6	6	14xd.	+½	4 5 9
North Met. Elec. Ordinary	1	10	10	47/6	+ 1/16	4 4 2
Do. do. 6% Pref.	1	6	6	30/–	—	4 0 0
Scottish Power	1	8	8	37/–	+6d.	4 6 6
South London	1	7	7	32/–	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/–	+6d.	7 2 10
Yorkshire Elec.	1	8	8	39/6	—	4 1 6
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	113	—	4 8 6
Do. 1955–75	,,	5	5	116	—	4 6 2
Do. 1951–73	,,	4½	4½	109	—	4 2 7
Do. 1963–93	,,	—	3½	98	—	3 11 5
London Elec. Trans. Gtd.	,,	—	2½	91	+1	2 15 0
London & Home Counties, 1955–75	,,	4½	4½	112	+3	4 0 4
London Passenger Transport, A	,,	—	4½	117½	+	3 16 9
Do. do. B	,,	—	5	120½	+1	4 3 0
Do. do. C	,,	4	4½	80	–1	5 6 3
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	149½	—	6 0 5
Anglo-Am. Tel. Pref.	Stock	6	6	115½	—	5 4 0
Do. Def.	,,	1½	1½	28½	—	5 5 3
Cable & Wireless 5½% Pref.	,,	4½	5½	102½	+1	5 7 5
Do. Ord.	,,	—	—	66½	—	—
Do. Income	,,	—	—	100½xd.	+½	3 19 6
Globe Tel. & Tel. Ord.	10	4½*	5½*	15½xd.	–½	3 13 4
Do. do. Pref.	10	6	6	13¾xd.	+⅛	4 6 6
Great Northern Tel.	10	20	20	38½	—	5 4 0
Marconi-Marine	1	10	7½	28/9	—	5 4 4
Oriental Telephone Ord.	1	12*	12*	27	—	4 3 6
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/–	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	15½	—	—
British Electric Traction Def. Ord.	,,	5	5	1000	—	—
Do. do. Pref. Ord.	,,	8	8	160	—	5 0 0
Brazil Traction	$100	70 cts.	$1	13½	+1½	7 8 2
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	35	—	—
Victoria Falls Ord.	1	20	12	3 1/16	+ 1/16	4 0 0
West Riding	1	6½	10	2	—	5 0 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	2xd.	–½	7 10 0
Assoc. Elec. Ord.	1	8	10	44/–	–1/–	4 11 0
Do. Pref.	1	8	8	37/–xd.	—	4 6 6
Babcock & Wilcox	1	8	10	42/6	– 1/16	4 14 1
British Aluminium Ord.	1	7½	10	45/9	–6d.	4 7 6
British Insulated Ord.	Stock	20	20	4⅝	– 1/16	4 6 6
Brush Ord.	Stock	Nil	Nil	27	+3	—
Callender's	1	15	15	4⅜	—	3 8 8
Do. 6½% Pref.	1	6½	6½	31/3xd.	+6d.	4 2 4
Crompton Parkinson Ord.	5/–	12½	12½	2¼xd.	—	—
Do. 8% Pref.	1	8	8	37/6xd.	+6d.	4 5 4
Electric Construction	1	7	10	1⅞	+ 1/16	5 6 8
Enfield Cable Ord.	1	25	25	5½	– 1/16	4 17 8
English Electric	1	Nil	Nil	29/0	–6d.	—
Do. dc. Pref.	1	6½	6½	25/6	–6d.	5 2 0
Ericsson Tel.	5/–	20	25	2 1/16	—	3 0 8
Ever Readv	5/–	35	45	26/–	–2/6	8 13 2
Ferranti Pref.	1	7	7	27/6xd.	+6d.	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	76/–	–2/–	4 12 0
Henley's	5/–	30	15	19/6	—	3 16 10
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	⅛	10	42/6	—	4 14 1
Lancashire Dynamo	1	10	20	3 1/16	—	6 5 6
Siemens Ord.	1	6	7½	28/9	—	5 4 4
Telegraph Construction	£1	Nil	7½	2 1/16	+ 1/16	3 5 0

* Dividends are paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

5335. "Electric wave filters." W. S. Percival. February 21st, 1936. (475490.)
10717. "Electron-discharge devices." C. S. Bull. April 14th, 1936. (475266.)
10720. "Electrical pickups." Telefunken Ges. für Drahtlose Telegraphie. April 12th, 1935. (475492.)
10839. "Mercury switches." A. F. Burgess (Adlake Co.). April 15th, 1936. (475267.)
13596. "High-frequency generators for feeding luminous electric-discharge tubes." J. Fodor and V. B. North. May 13th, 1936. (475413.)
13794. "Television systems." Telefunken Ges. für Drahtlose Telegraphie. May 15th, 1935. (475189.)
14051. "Telephone systems." Automatic Electric Co., Ltd. in liquidation) and C. E. Beale. May 18th, 1936. (475419.)
14055. "Band-pass electrical wave filters." Mullard Radio Valve Co., Ltd., and R. G. Clark. May 18th, 1936. (475420.)
14299. "Electric metering apparatus." R. Mercer (Sangamo Electric Co.). May 20th, 1936. (475512.)
14400. "Television and like systems." Baird Television, Ltd., and V. Jones. May 21st, 1936. (475517.)
14407. "Portable electric cleaning and polishing tools." A. V. Summers. May 21st, 1936. (Cognate application 11039/37.) (475518.)
14426. "Supports for filamentary cathodes in thermionic valves." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. August 3rd, 1935. (475521.)
14529. "Magnetic deflecting systems for electron-discharge apparatus." Fernseh Akt.-Ges. May 23rd, 1935. (475527.)
14547. "Electrical wave filters." Standard Telephones & Cables, Ltd. July 2nd, 1935. (Cognate application 14548/36.) (475275.)
14549. "Thermionic oscillation generator circuits." Standard Telephones & Cables, Ltd., B. B. Jacobsen and V. J. Terry. May 22nd, 1936. (475530.)
14550. "Thermionic oscillation generator circuits." Standard Telephones & Cables, Ltd., and B. B. Jacobsen. May 22nd, 1936. (475531.)
14551. "Tuning controls for electrical apparatus, particularly radio apparatus." Standard Telephones & Cables, Ltd., S. G. Knight and E. I. Staples. May 22nd, 1936. (475532.)
14571. "Electric-discharge devices." British Thomson-Houston Co., Ltd. May 24th, 1935. (475561.)
14597. "Glands for sealing, bonding and earthing electric cables." F. A. Ross. May 23rd, 1936. (475364.)
14700. "Band resistances for the continuous regulation of heavy currents." Akt.-Ges. Brown Boveri & Cie. June 5th, 1935. (Addition to 467574.) (475427.)
15217. "Overload indicators for electric conductors." T. W. Corbin. May 29th, 1936. (475429.)
15898. "Moving-coil oscillographs and the like." B. H. C. Matthews, E. C. M. d'A. Fonesca and E. S. Shire. June 6th, 1936. (475431.)
16447. "Alternating-current electric switches." General Electric Co., Ltd., and R. Rudenberg. June 12th, 1936. (475370.)
18347. "Multi-core high-frequency conductors." Felten & Guilleaume Carlswerk Akt.-Ges. July 2nd, 1935. (475374.)
18871. "Photo-electric exposure meters." Zeiss Ikon Akt.-Ges. July 10th, 1935. (Addition to 451530.) (475203.)
19006. "Apparatus for electro-plating metallic articles." Brightside Plating Co., Ltd., and J. Kronsbein. July 9th, 1936. (475204.)
19567. "Means for cooling dynamo-electric machines." P. A. H. Mossay and Laurence, Scott & Electromotors, Ltd. July 14th, 1936. (475434.)
19705. "Alternating-current voltmeters." L. B. Turner. July 16th, 1936. (475287.)
20525. "Electron-discharge devices." Standard Telephones & Cables, Ltd. October 3rd, 1935. (475376.)
21387. "Controlling mechanism for electric signalling or indicating systems." Instanta Electric, Ltd., and H. A. Thompsett. August 1st, 1936. (475292.)
23819. "Electric cable systems." Okonite-Callender Cable Co., Inc. October 22nd, 1935. (475298.)
24023. "Synchronous alternating-current machines." E. J. Timberlake. September 2nd, 1936. (475442.)
24488. "Electrical precipitating apparatus for purifying air." Westinghouse Electric & Manufacturing Co. October 15th, 1935. (475443.)
26066. "Arrangements for recording machines operating on the Paulsen principle, and associated with telephone subscribers' sub-stations for recording dictation and telephone conversations." C. Lorenz Akt.-Ges. September 27th, 1935. (475444.)
26336. "Electric cable systems." Okonite-Callender Cable Co., Inc. December 7th, 1935. (475300.)
26562. "Electric impedance networks." Telefunken Ges. für Drahtlose Telegraphie. September 30th, 1935. (475446.)
27568. "Self-contained electric generating systems." J. V. Gil and Kohler Co., Ltd. October 10th, 1936. (475378.)
28568. "Magnetic deflecting systems for cathode-ray tubes." Fernseh Akt.-Ges. October 24th, 1935. (Addition to 475527.) (475539.)
29082. "Pointer tuning indicators for wireless receiving sets." Radiowerk Horny Akt.-Ges. February 19th, 1936. (475379.)
34064. "Electrical wave transmission systems." Standard Telephones & Cables, Ltd. December 11th. 1935. (475310.)
34632. "Method of and arrangement for magnetically blowing electric arcs on metal electrodes." I. G. Farbenindustrie Akt.-Ges. January 28th. 1936. (475227.)
35309. "Electric circuit interrupters of the gas-blast type." British Thomson-Houston Co., Ltd. December 24th, 1935. (475311.)
35893. "Thermionic-valve arrangements." Marconi's Wireless Telegraph Co., Ltd. (Telefunken Ges. für Drahtlose Telegraphie). December 31st, 1936. (475457.)

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1222. "Devices for protecting rectifiers containing an ionised gas." Soc. Anon. Hewittic, and M. Demontvignier. January 25th, 1936. (475459.)
4512. "Electric welding machines." British Thomson-Houston Co., Ltd. February 14th, 1936. (475238.)
4601. "Wireless receiver." S. S. Sastry. February 16th, 1937. (475463.)
4986. "Storage-battery retainers and methods of making same." Chloride Electrical Storage Co., Ltd. (C. A. Hall). February 19th, 1937. (475464.)
6080. "Multiplex telephony and the like." F. C. P. Henroteau. January 16th, 1937. (475239.)
6963. "Electric-discharge tubes and devices employing such tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 12th, 1936. (475467.)
7728. "Self-contained electric generating systems." J. V. Gil and Kohler Co., Ltd. October 10th, 1936. (Divided out of 475378.) (475392.)
7895. "Electric gas blast switches." F. Strauss (née Ruppel). March 19th, 1936. (475246.)
8886. "Type-printing telegraph apparatus." Creed & Co., Ltd. May 22nd, 1936. (475468.)
9186. "Electrical alarm system suitable for boilers." A. B. S. Laidlaw. March 31st, 1937. (475248.)
9438. "Thermionic amplifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken and L. W. Mayer. April 2nd, 1937. (475469.)
9637. "Electric-discharge lamps." General Electric Co., Ltd. April 3rd, 1936. (475395.)
10156. "Electric circuit disconnecting or fuse boxes for use with underground cable systems." T. W. Mackay. April 9th, 1937. (475472.)
11308. "Carbon anodes for intensive electric arcs." Soc. le Carbone-Lorraine. May 18th, 1936. (475252.)
12172. "Television and like transmitter apparatus." Telefunken Ges für Drahtlose Telegraphie. April 28th, 1936. (475473.)
12592. "Radio and like transmitters." Telefunken Ges. für Drahtlose Telegraphie. May 2nd, 1936. (475397.)
12711. "Telegraph exchange systems." Siemens & Halske Akt.-Ges. May 4th, 1936. (475474.)
14850. "Thermionic amplifiers." Standard Telephones & Cables, Ltd. June 20th, 1936. (475400.)
17239. "Thermionic valves having thoriated cathodes." British Thomson-Houston Co., Ltd. June 20th, 1936. (475480.)
17373. "Film driving apparatus, more particularly for use in connection with sound recording apparatus." British Thomson-Houston Co., Ltd. (Allgemeine Elektricitats-Ges.). June 22nd, 1937. (Addition to 456884.) (475260.)
17439. "Electric hot-plates." Revo Electric Co., Ltd., and F. H. Reeves. June 23rd, 1937. (475261.)
18073. "Piezo-electric crystals." British Thomson-Houston Co., Ltd. June 29th, 1936. (475482.)
19257. "Horizontally disposed electric hot-water reservoirs of the overflow discharging type." T. Stiebel. July 12th, 1937. (475338.)
28501. "Light-sensitive and light-producing electron-discharge devices." V. Zeitline, A. Zeitline and V. Kliatchko. May 18th. 1935. (Divided out of 14065/36, 14066/36 and 14067/36.) (475547.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 8th:—

Presmet, No. 579787, and Presap, No. 579868. Class 5. Alloys (metallic), unwrought and partly wrought. No. 579869. Class 13. Electrodes of ordinary metal for electric welding. No. 579870. Class 18. Electric welding plant.—British Insulated Cables, Ltd., Prescot, Lancs.

Wilvermore (lettering and design). No. 580604. Class 6. Electric washing, wringing and clothes ironing machines.—W. and V. Moore, Ltd., 354-356, Corn Exchange Buildings, Manchester.

Aristocrat. No. 575833. Class 8. Instruments, apparatus and parts thereof for use in radio-telegraphy, telephony and television, &c.—Radio Gramophone Development Co., Ltd., Globe Works, Newtown Row, Birmingham.

Berners Radio—A Berners Radio, Ltd., Product (lettering and design). No. 578820. Class 8. Instruments, apparatus and parts thereof for use in radio-telephony and telegraphy, television, &c.—Berners Radio, Ltd., Great West Road, Brentford, Middlesex.

Philoscope. No. 579126. Class 8. Instruments and apparatus and parts thereof and measuring, testing and recording apparatus and parts thereof.—Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.

Powerplus. No. 580808. Class 8. Electric batteries (not for medical purposes). No. 580472. Class 13. Electric lamps (ordinary) and flash lamp cases made of ordinary metal.—New Universal Stores, Ltd., Reading Lane, E.8.

[The application by the Curtis Lighting Co. of Great Britain, Ltd., recorded in our last issue, was for the registration of "Lunax" (Class 14) not "Lumax" (Class 13) as stated.]

The E.I.B.A. (Newcastle)

Over 400 guests were present at the annual ball of the Electrical Industries Benevolent Association held at Newcastle-upon-Tyne. Colonel S. E. Monkhouse and Mrs. Monkhouse received the guests. Among those present were Mr. Frank Parkinson (president) and Mrs. Parkinson.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bacup.—Houses (110), Cutler Greens, Stacksteads; borough surveyor.

Barking.—Extensions to premises, for Scoffin & Willmott, Ltd., Alfred's Way.

Barnard Castle.—Houses (56); R.D.C. surveyor.

Barnsley.—Houses (152), California Gardens estate, and flats, Pitt Street; borough engineer.

Bedworth.—Houses (40), Wootton Street site; N. D. Martin, U.D.C. surveyor.

Birmingham.—Factory and offices (£30,000), Cliveland Road, for Turner Bros., Ltd., Aston; Wm. Wilkinson & Son, builders, Hutton Road, Birmingham. Factory and offices near Fazeley Street; T. Elvins & Son, builders, Soho Hill. Laundry buildings (£60,000), Clay Lane, Acock's Green, for the Birmingham Co-operative Society, Ltd., High Street, Birmingham; C.W.S. Building Dept., Balloon Street, Manchester.

Blackburn.—Houses (124), Higher Hill Farm; borough surveyor.

Bradford.—Premises for Grammar school (£37,000); governors.

Brighton.—Houses (164), Carden Avenue estate (£65,850); borough engineer.

Caernarvonshire.—Reconstruction of Snowdon Street infants' school, Portmadoc; W. L. Jones, architect, County Offices, Shire Hall Street, Caernarvon.

Caerphilly.—Houses, Taffs Wells, Pwllypant; U.D.C. surveyor.

Cardiff.—School (£44,948), Colchester Avenue, for the E.C.; D. Davies & Sons, Ltd.

Chadderton.—Houses (114), Higher House Farm estate; E. E. England, architect, 12, Clegg Street, Oldham.

Cheltenham.—Factory, junction of Swinton Road and Kingsditch Lane, for Gibbard & Co., Ltd. Heston.

Chester.—School, Lache estate; city surveyor. Extensions to City school (£44,559); G. H. Heywood, Ltd.

Chesterfield.—Houses (12), Handley Road; Revill & Beresford. Houses (68), near Peveril Road; Frank Haslam, Ltd. Maternity home, Highfields; Brawshaw, Gass & Hope, architects.

Chichester.—Development of Donnington estate; Major H. Baker.

Dagenham.—Central works depôt and stores (£23,300), Frizlands Lane; U.D.C. surveyor.

Dewsbury.—Extensions for Ottewell & Co., Locke Street.

Doncaster.—Factory, Wheatley Park, for International Harvester Co.

Douglas (I.O.M.).—Houses and shops, Pulrose; borough engineer.

Dudley.—Premises, Castle Street, for Westminster Bank, Ltd.; Harvey & Wicks, architects, 5, Bennett's Hill, Birmingham.

Eastbourne.—Extensions to Princess Alice Hospital (£15,000); B. Stevens, architect, 31, Cornfield Road.

Exeter.—Houses (64), Bowhay estate; city architect. Church, Dunsford Road; R.C. trustees. School, Wonford, for the E.C.

Felling-on-Tyne.—School, Heworth, for the E.C.

Folkestone.—Amusement hall, Victoria Pier (£100,000); Wood, Kendrick & Reynolds, architects, 57, Colmore Row, Birmingham.

Fort William.—Reconstruction and enlargement of town hall; burgh surveyor.

Glasgow.—Community centre, Knightswood (£120,000); city architect.

Gravesend.—School, Milton Grange; R.C. trustees.

Hastings.—Extensions to Queen's Hotel; Ward, Son & Wray, architects.

Hebburn-on-Tyne.—Houses (140), for the North-Eastern Housing Association; A. V. Clerey and Sons, builders, 14, Frederick Street, Sunderland.

Hove.—Flats (42), Kingsway; B. Marshall & Partners.

Ilkeston.—Houses (52), clearance areas; borough engineer.

Ipswich.—Houses, Gloucester estate (£21,950). Priory estate (£36,260), and Wherstead Road (£7,123); Building & Public Works Construction Co., Ltd. Houses (138), Whitton estate; J. Gerrard & Sons, Ltd. Development of estate; Red House Development Co., Ltd. School (£30,898); Sadler & Sons.

Irish Free State.—(ENNISCORTHY, Co. WEXFORD).—School, for the Vocational E.C., Wexford; J. W. O'Sullivan, architect and engineer, 104, Grafton Street, Dublin. (DUBLIN).—Houses (453); G. & T. Crampton, Ltd., contractors.

Jarrow-on-Tyne.—Premises, Monckton, for Hanlons, Ltd., Tyne Dock, South Shields. Schools and improvements to existing schools; J. S. Weir, borough engineer.

Kidderminster.—Development of Sion Hill estate; J. L. Richards & Son, builders, Redditch.

Kincardineshire.—Extensions to Inverbervie school (£8,500); architect, County Council, Stonehaven.

Lancing.—Development of Wellan Park estate; Lynes & Wells.

Leominster.—Houses (50); H. Tomkys, borough engineer and surveyor, Municipal Offices.

Lichfield.—Mineral water store, Greenhill; J. Sims, Ltd.

London.—(BATTERSEA).—Rehousing, Hibberd Street (£197,000); L.C.C. architect, County Hall, S.E.1. (BETHNAL GREEN).—Tenements, near Globe Road (£75,000); L.C.C. architect. (HACKNEY). Maternity block (£71,000); L.C.C. architect. (KENSINGTON).—Operating theatre, St. Charles' Hospital (£5,346); L. H. & R. Roberts, Ltd., 144, Lower Clapton Road, E.5. (LAMBETH).—Alterations to works, Union Cold Storage Co., Ltd., Stamford Street. Extensions to hospital (£19,731); Patman & Fotheringham, Ltd., 15, Park Street, N.1. (LEWISHAM).—Extensions for the Holmes Plating Co., Ltd., The Avenue, Blackheath. (SHOREDITCH).—Rehousing, Dove Row and Purcell Street (£516,000); L.C.C. architect. (PADDINGTON).—Houses and flats, Gloucester Square and Devonport Mews; T. P. Bennett & Son, 43, Bloomsbury Square, W.C.1.

Manchester.—Houses, Arcadia Avenue and Wood Road, Baguley, for Hillingson Estates Co., 29, Peterbborough Road, Harrow; Swannell & Sly, architects, High Street, Rickmansworth. Houses, Furnival Road and Pine Street, Gorton, for F. Annable & Sons, 73, Hyde Road, West Gorton; H. Davies, architect, 4, St. Mary's Parsonage. Houses, Herristone Road and Chudleigh Road, Crumpsall, for W. J. Davies (Builders), Ltd., Wilton Road, Cheetham Hill; Roberts, Wood & Elder, architects, 26, King Street. Flats and shops, Lansdowne House, Wilmslow Road and Ford Lane, Didsbury; G. Westcott, architect, 31, Byrom Street. Motor showrooms, Stockport Road, Longsight, for Halsbury Motors, 268, Stockport Road, Longsight; Normanton's, Ltd., contractors, 167, Plymouth Grove, Manchester. Warehouse and offices, Newcastle Street, Mount Street and George Street, Hulme, for Jessop & Baird, Ltd., 65, George Street; Sparke & Stephens, Ltd., contractors, Newcastle Street, Hulme.

Middlesbrough.—Extensions to premises for Barrett & Co., Ltd., Linthorpe Road. Extensions to premises for Feversham Joinery Works, Ltd., Lower East Street.

Newcastle (STAFFORDSHIRE).—Houses (84), Newcastle Street, Silverdale; J. Jones (N.S. Staffs), Ltd., building contractors, Liverpool Road. Flats and houses, Brampton-Hempstalls Lane, and houses, near Templar Terrace, Porthill; Hollins & Jones, architects, Lloyd's Bank Chambers. Shops and offices at the junction of High Street and Ironmarket (£34,580); Cooper Bros. (Builders), Ltd., Catherine Street, Macclesfield.

Newcastle-on-Tyne.—Rebuilding of paint works after fire for J. Dampney & Co., Ltd. (£30,000); Gordon Durham & Co., builders, East Boldon, Co. Durham.

Northumberland.—School, Cornhill, for the C.C.; county architect, County Hall, Newcastle-on-Tyne.

Oldbury.—Houses (20), Holt Farm estate (£7,700); borough engineer. Cinema, Wolverhampton Road; Regal, Ltd. Additions to works, Wolverhampton Road; British Stampings, Ltd. Extensions to works, Fountain Lane; Pazo, Ltd.

Ossett.—School, Station Road, for the E.C.

Otley.—Extensions to Victoria works; Wm. Walker & Sons, Ltd.

Rochdale.—Rebuilding the King's Cinema, Kings Road; Drury & Gomersall, builders, 11, Imperial Buildings, Oxford Road, Manchester.

Rowley Regis.—Extension to factory, Cherry Orchard, Old Hill, for James Potts & Co.

Sheffield.—Houses and garages and conversion of Ruskin House into flats, Bole Hill Road and Bell Hagg Road, Albert Road and Rushdale Road; J. C. Mason, builder, 55, Norfolk Park Avenue. Houses, garages, shops and flats, near Twentywell Lane; O. E. Hanwell, Twentywell Lane. Offices and factory, Mappin Street, Charlotte Lane and Pit Street, for Cooke & Stevenson, Ltd., Clumba works, Solly Street; S. Elden Minns, architect, Wharncliffe House, Bank Street.

Solihull.—Shops and flats, near High Street, for Bond Smith & Co., 14, Hanover Square, London, W.1; Bragg Bros., builders.

Somerset.—Court-house, Axbridge (£10,500); county architect.

South Shields.—School, Wenlock Road; borough engineer.

Spalding.—Houses (34), Goodfellows Road, Spalding Common, and road, &c.; R. W. Hastings, clerk to U.D.C., Market Place.

Spenborough.—Houses, Birkenshaw Lane site; U.D.C. surveyor, Cleckheaton.

Stalybridge.—Houses, Huddersfield Road; J. E. Axe.

Stockton-on-Tees.—Houses (32), Colchester Road, &c., for E. Benjamin; G. P. Stainsby, architect, 25, High Street. School, Junction Road (£26,000); L. Brown & Sons, builders, Boathouse Lane.

Sunderland.—Houses (1,018), Springwell Farm estate, and flats, High Street, for the North-Eastern Housing Association, Northumberland Road, Newcastle-on-Tyne. Houses (24) and garages, West House Park estate, and houses, Neale Street; Bell Bros., builders, Newcastle Road. Sports stadium for North-East syndicate (£250,000); Marshall, Tweedy & Bourn, architects, 129, Pilgrim Street, Newcastle-on-Tyne.

Surrey.—Schools, Bandon Hill, Beddington, Chertsey, and New Road, Chilworth, for the County E.C., Kingston-upon-Thames.

Sussex.—Health centre, Lancing, and school, Birdham; West Sussex county architect. Schools, Lancing and Rustington, for West Sussex E.C.

Treforest (GLAMORGAN).—Factory, Treforest estate, for British Activon, Ltd.

Wakefield.—Estate development, near Barnsley Road; Kay & Lunan.

Walsall.—Houses (35), Harden estate (£11,267); Sabin & Young, Ltd. Lodging house, Upper Rushall Street (£6,000); borough engineer.

Walthamstow.—School, Handsworth Avenue (£55,215), for the E.C.

Warrington.—Houses, Hallows Avenue, Withers Avenue, and Smith's Drive; R. & S. Smith, builders, Orford.

West Hartlepool.—Houses (12), Waverley Terrace; Potter & Monaghan, builders, Burn Road.

Westmorland.—County offices, Kendal (£54,818); county architect.

Whiston.—Houses (137), seven parishes; Gornall & Wainwright, architects, Britannic House, 8, Hardshaw Street, St. Helens.

Wolverhampton.—Houses (14), Gibbons Road; Brookes & Edwards. Houses (150), Hollybush estate; A. M. Griffiths & Son, Ltd. Houses (72), Rake Gate Farm estate, Oxley Moor; E. A. Colman. Houses (24), Spring Hill estate; W. Bannister & Co.